Appendix A

1987 Shallow Soil-Gas Survey

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

SUMMARY OF FIELD ANALYTICAL SERVICES PROVIDED TO EG&G IDAHO

CONTRACT NO. C87-131432

December 1987

873-1312.001

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

December 1, 1987 Our ref: 873-1312.001

EG&G Idaho
PO Box 1625
Idaho Falls, Idaho 83415-3107

ATTENTION: Larry Hull, Project Geologist

1. INTRODUCTION

This letter provides a brief summary of field analytical services provided to EG&G Idaho, in conformance with EG&G Contact No. C87-131432. As defined by the scope of this contract, Golder Associates, Inc., was directed by EG&G Idaho to perform a field analytical survey for volatile organic constituents (VOCs) in the vadose zone of a chemical disposal facility. This facility is located within the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). It was the intent of the survey to determine the identification, location, and relative concentration of selected chlorinated and aromatic VOCs in the vadose zone of the project site and adjacent areas.

2. PROJECT SITE

The project site is a land disposal area located within the RWMC of the INEL known as the Subsurface Disposal Area (SDA). To provide a comprehensive survey of the SDA, 250 locations were identified by EG&G for sampling and analysis. These sampling locations formed a grid encompassing the SDA with sampling at 200-ft intervals. In addition to the grid locations, approximately 60 supplemental locations were also directed for sampling. With the completion of the project, a total of 136 grid and 63 supplemental locations had been sampled and analyzed. A base map showing an outline of the SDA and grid sampling locations for the project site is presented in Appendix A.

3. PROCEDURES AND APPARATUS

Soil gas samples were collected on-site and immediately analyzed in a field laboratory located near the north border of the SDA. Soil gas collection was facilitated by driving a section of high-strength steel pipe into the ground, pumping soil gas through the pipe to the surface, and collecting a portion of the gas stream in a gas-tight sampling syringe. The syringe was then immediately transferred to the field lab for gas chromatographic analysis.

3.1 Soil Gas Sampling

3.1.1 Overview

To provide an access for soil gas sampling, a 15-mm o.d. drill was used to bore a hole into the soil to a maximum depth of 30 in. A high-strength steel pipe (1.3 meter, 19 mm o.d.), which served as a fast

sampling probe, was then placed at the hole opening and driven into the ground. The sampling probe was threaded at the top to allow coupling to a hand operated slide hammer used to drive the probe. Before the probe was driven, the drive end was fitted with a metal cap to prevent the end from clogging. Once installed, the cap was displaced from the end of the probe to allow soil gas to enter from the bottom. To withdraw a gas sample, the probe was connected to a battery operated pump, purged for a specified time, and a gas sample was removed from the gas stream with a glass syringe. Specific steps for the soil gas sampling are summarized below:

3.1.2 Procedure

1. A hole was excavated to a maximum of 30 in. using a hand-held electric drill fitted with a ½ in. drill bit.

2. Using a sliding-hammer attachment, a 5/8-in. o.d. carbon-steel probe was driven to a maximum depth of approximately 30 in. The end of the probe was fitted with a steel cap to prevent soil from entering the probe as it was driven.

3. A steel rod was inserted into the probe to displace the cap and allow soil gas to enter.

4. A battery operated pump was attached to the top of the probe using surgical rubber tubing and a stainless steel quick-connect coupler with a 3/8-in. reducing fitting.

5. The probe-drill hole annular space was sealed with modeling clay and probe void volume was evacuated for 1 to 2 minutes at a rate of 2 to 3 L per minute. To ensure the organic content of the gas stream had reached a constant level, the exit of the pump was monitoring with an OVA or HNU portable organic vapor analyzer.

6. The soil gas sample was obtained by inserting a gas tight syringe through the rubber tubing to intercept the gas stream. The sample was collected downstream of the probe, at a point just above the stainless steel coupler. Once collected, the soil gas sample was sealed in the syringe to prevent escape of the sample.

7. The syringe was then transported to the remote field laboratory for gas chromatographic analysis.

Exceptions to the procedures described above are as noted:

1. During the sampling of the west end of the SDA (west of Row 9), a hole was not drilled before probe installation. The probe was driven to a depth of 12 in.

2. Samples obtained from the vadose sampling wells WWW-1, 78 and 77, were obtained by attaching the pump to the access ports provided at the well head.

3. Samples from neutron access tubes (denoted as NAT), Pits 19 and 20 (denoted P19 and P20) and transuranic (TRU) locations, were obtained by pumping through a 10- to 20-ft stainless steel tube inserted into the bottom of the access tube.

3.1.3 Modifications

At several locations on the SDA, high levels of VOCs were encountered. The levels found were high enough to produce sampling artifacts from the Teflon lined sampling train. Suspecting the Teflon could

be adsorbing VOCs, the sampling train initially designed for the project was modified to eliminate Teflon surfaces. The procedures used and apparatus described above reflect this modification of sampling protocol. The majority of the samples collected during the study were obtained with the modified sampling procedure to ensure the integrity of the sample.

3.2 Soil Gas Analysis

Analysis of soil gas samples was performed on-site with a HNU Model 321 field gas chromatograph (GC). The GC was fitted with two fused silica VOCOL (Supelco Co, Bellefonte, PA) capillary columns, each originating from a common injector and terminating at an electron-capture detector and a photoionization detector, respectively. The GC was operated isothermally at 80°C. Standard mixtures of VOCs were prepared as needed by serial dilution of pure chlorinated and aromatic compounds (Supelco, Bellefonte, PA) in dodecane or hexane. A Shimadzu GR-3A integrator and an Esterline Augus stripo chart recorder were used to record sample chromatograms. The GC was operated in a field trailer receiving AC power from the RWMC. The trailer and power were provided by EG&G.

Once received from the field, soil gas samples were directly injected into the GC for analysis. The response of sample constituent identified was then compared to those of VOC standards to determine the concentration in the sample. Each sample was screened for 10 chlorinated and two aromatic compounds. These compounds are listed in Table A-1 with their assigned level of detection. Generally, the level of detection would vary from sample to sample depending on individual sample constituents and sample size. For consistency in reporting, detectable limits were assigned based on typical sample amount injected for GC analysis and daily detector response. The values for sample detectable limits ranged from 0.01 to 1.0 ug/L. The "P" listed in the sample analytical results denotes the constituent was positively identified in the sample but the level was below assigned values for quantitation. The chlorinated VOC chloroform, was intended to be a target compound for the survey but in most chromatograms, the elution of chloroform was obscured by large concentrations of 1,1,1-trichloroethane and carbon tetrachloride. As a result, chloroform was not reported for the survey.

4. ANALYTICAL RESULTS

4.1 Presentation of Results

The project analytical results are presented in six appendices attached to the end of this report. Appendix A is a base map of the SDA showing grid sampling locations for the project site. Appendix B consists of a tabular summary of the sample analytical results and quality assurance analyses. This summary is also provided in an ASCII machine-readable format. Appendices C through F are plots and concentration isopleths of major compounds identified during the survey. These plots are scaled to fit the provided base map.

4.2 Quality Assurance and Control

The high level of VOCs found in several areas of the project site dictated the highest levels of quality assurance and control to minimize cross contamination and maintain sample integrity. To achieve a high level of analytical confidence, several methods of quality assurance and control were implemented throughout the project.

The first method involved frequent sampling of the soil gas sampling apparatus. The "X" and "XP" designations in Appendix B identify quality assurance checking of the gas sampling train (the results reported indicate the quantities measured of target VOCs). Before collecting QA samples, the pump was run briefly to withdraw gases from the probe and sampling train. A sample was then collected with a syringe and analyzed with the gas chromatograph. Once the sampling train modification discussed previously was implemented, artifacts from the sampling apparatus were below detectable limits. A blank sample of the sampling apparatus was typically collected at least once a day as a minimum, with sampling subsequent any gas samples showing high levels of VOCs. Over 30 samples of the soil gas sampling train were analyzed for the purpose of checking the sampling apparatus.

The next method of quality assurance focused on the gas sampling syringes used to collect, transport, and store the sample before analysis. Once again, the high levels of VOCs encountered during the survey dictated constant monitoring of sampling apparatus to identify and insure against any sampling artifact. Since a common battery of syringes was used during the project, it was necessary to frequently analyze syringe VOC artifacts. It was found that soil gas samples with high levels of VOCs left measurable levels of each of the target compounds in the sampling syringe. To eliminate this interference, each syringe was solvent-rinsed with hexane and heated in a oven at 100°C for 10 to 15 minutes to remove any residual VOC contamination. After cleaning, the syringe was then tested by drawing ambient air into the syringe and injecting the air into the gas chromatograph. The sampling syringe was not cleared for soil gas sampling until the level of artifact VOCs were reduced below detectable levels.

Another method of quality assurance involved VOC standards for quantitation. Multiple levels of target compounds were run each day to check the performance of the GC and to determine a response factor for each target VOC. These response factors were then used to calculate the concentrations found in individual soil gas samples. Throughout the project, an average of seven standard runs were made for system checking and quantitation each day. Specific standards were also prepared on-site for the constituents identified in the majority of the samples. The concentrations of individual VOCs in these standards were adjusted to match those concentrations found in soil gas samples.

To account for any variation of soil gas concentration with atmospheric pressure, an additional method of quality assurance involved periodic monitoring of VOCs at selected probe locations. Two probe locations, E-15 and E-19, were selected for this function, based on the levels of VOCs measured and the differences of constituents found.

4.3 Field Results

At EG&G's request, summaries of soil gas sampling and analyses were provided to EG&G representatives each day for their review. As indicated on each summary, the field data presented was preliminary and subject to change, pending a complete review of the analytical results. Differences of field data with values reported in Appendix A can be expected since the field summaries were based on limited single point standard calibration, whereas the final report results are based on a multipoint calibration curve.

Golder Associates is pleased to provide these engineering and analytical services and will be looking forward to providing EG&G Idaho with similar services in the future. Please don't hesitate to contact us if you have any question.

Sincerely,

GOLDER ASSOCIATES, INC.

Anthony S. Burgess
Principal

Douglas J. Morell
Project Manager

Michael Schlender
Senior Chemist

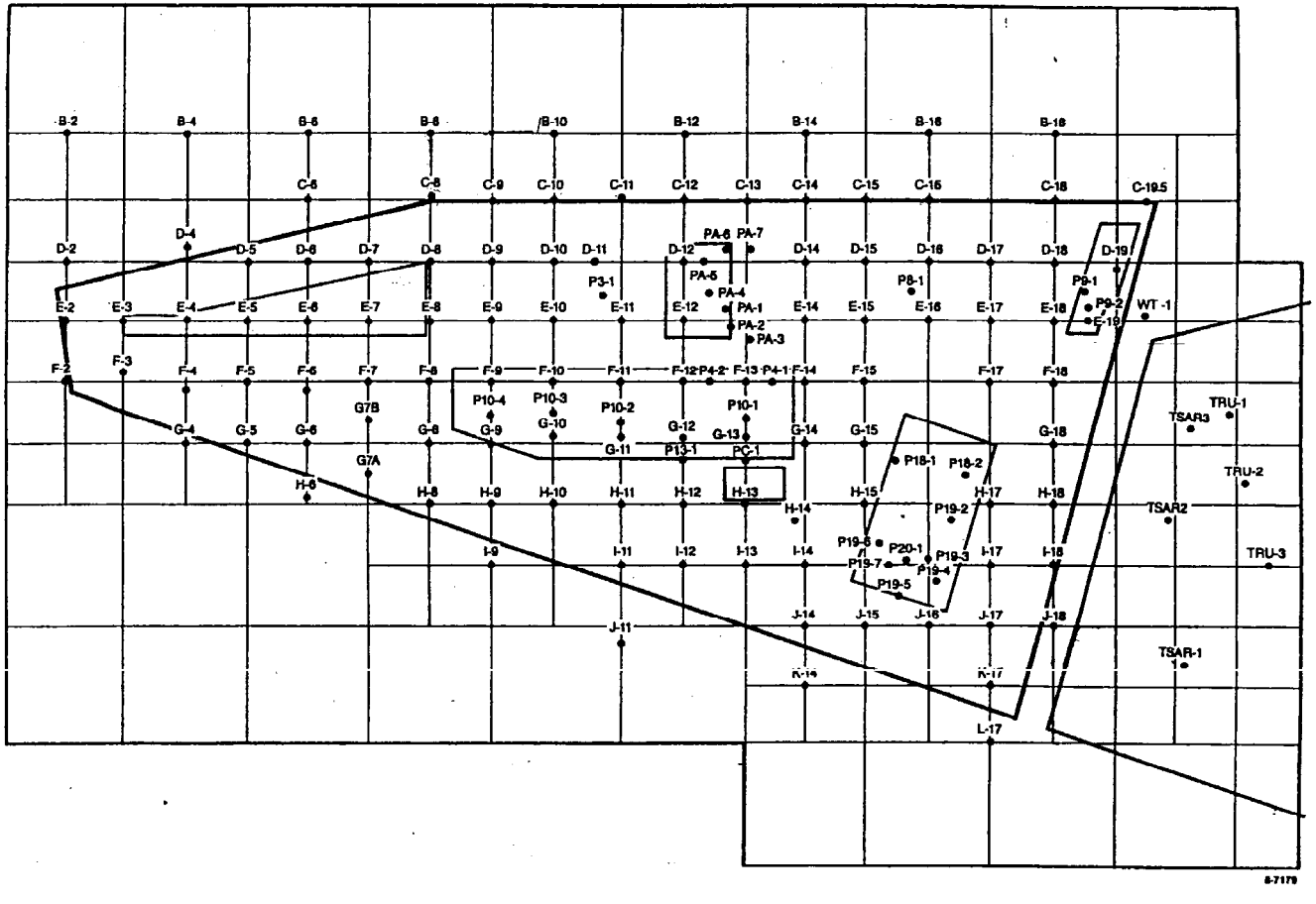
AB/MS/sw

Enclosures

TABLE A-1

EG&G SOIL GAS SURVEY
TARGET COMPOUNDS FOR GAS CHROMATOGRAPHIC
ANALYSIS AND ASSOCIATED DETECTION LIMITS

Data Base Description	Compound	Detection Limit
CHEM 1	1,1,1-trichloroethane	0.01 µg/L
CHEM 2	Carbon tetrachloride	0.01 µg/L
CHEM 3	Trichloroethene	0.01 µg/L
CHEM 4	Tetrachloroethene	0.01 µg/L
CHEM 5	1,1-dichloroethene	0.6 µg/L
CHEM 6	Methylene chloride	0.6 µg/L
CHEM 7	1,2-trans-dichloroethene	0.6 µg/L
CHEM 8	Trans-1,3-dichloropropene	0.5 µg/L
CHEM 9	1,2-dichloropropane	0.6 µg/L
CHEM 10	1,1,2-trichloroethane	0.6 µg/L
CHEM 11	Benzene	1 µg/L
CHEM 12	Toluene	1 µg/L


B-2
B-4
B-6
B-8
B-10
B-12
B-14
B-16
B-18
C-6
C-8
C-9
C-10
C-11
C-12
C-13
C-14
C-15
C-16
C-18
C-19.5
D-2
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-14
D-15
D-16
D-17
D-18
D-19
PA-6
PA-7
PA-5
PA-4
PA-1
PA-2
PA-3
P3-1
P8-1
P9-1
P9-2
E-19
WT-1
E-2
E-3
E-4
E-5
E-6
E-7
E-8
E-9
E-10
E-11
E-12
E-14
E-15
E-16
E-17
E-18
F-2
F-3
F-4
F-5
F-6
F-7
F-8
F-9
F-10
F-11
F-12
P4-2
F-13
P4-1
F-14
F-15
F-17
F-18
G7B
P10-4
P10-3
P10-2
P10-1
TRU-1
TSAR3
G-4
G-5
G-6
G-8
G-9
G-10
G-11
G-12
G-13
G-14
G-15
G-18
G7A
P13-1
PC-1
P18-1
P18-2
TRU-2
H-6
H-8
H-9
H-10
H-11
H-12
H-13
H-14
H-15
H-17
H-18
P19-2
TSAR2
P19-6
P20-1
P19-3
I-9
I-11
I-12
I-13
I-14
P19-7
P19-4
I-17
I-18
TRU-3
P19-5
J-11
J-14
J-15
J-16
J-17
J-18
TSAR-1
K-16
K-17
L-17
8-7179

Appendix B

Appendix B of the original report contained the soil-gas data, but is not included here. However, original data for key VOCs has been converted from µg/L to ppmv and is included at the end of the Golder Associates' report. Also included is a map of the sample grid points and a contour plot of carbon tetrachloride concentrations in ppmv that was not part of the original report provided by Golder Associates.

Appendix C

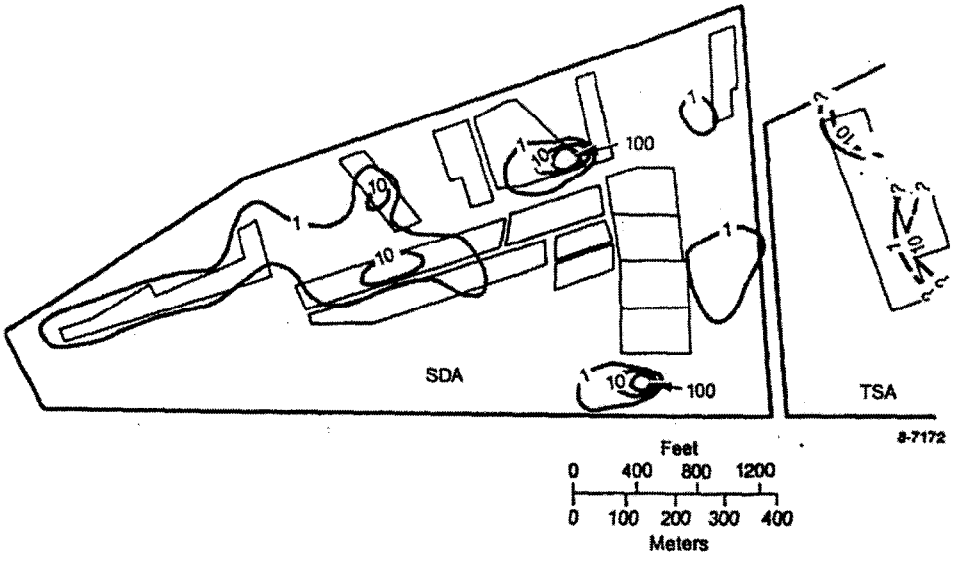


Figure 31. Isopleth map of the concentrations of 1,1,1-trichloroethane measured at the RWMC [units of micrograms per liter (µg/L)].

Appendix D

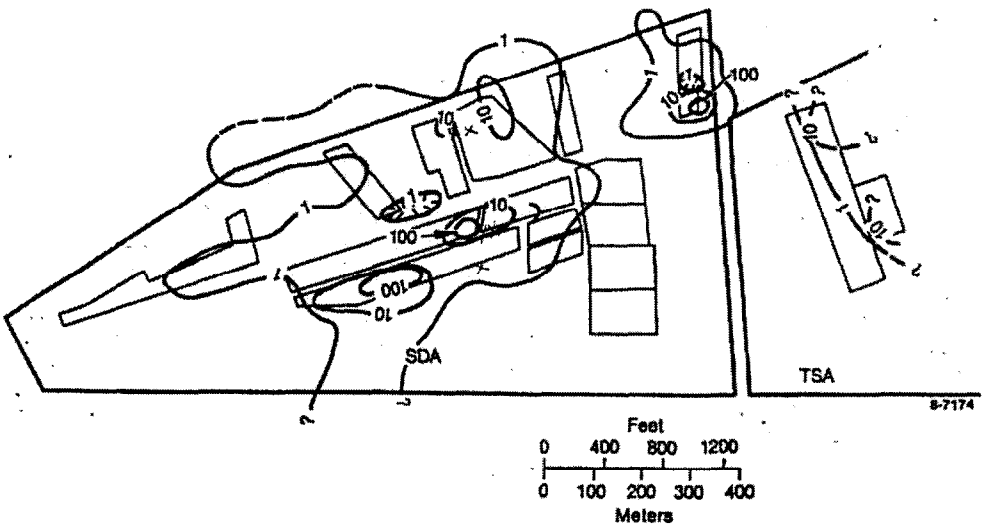


Figure 28. Isopleth map of the concentrations of carbon tetrachloride measured during the soil-gas survey at the RWMC [units of micrograms per liter (µg/L)].

Appendix E

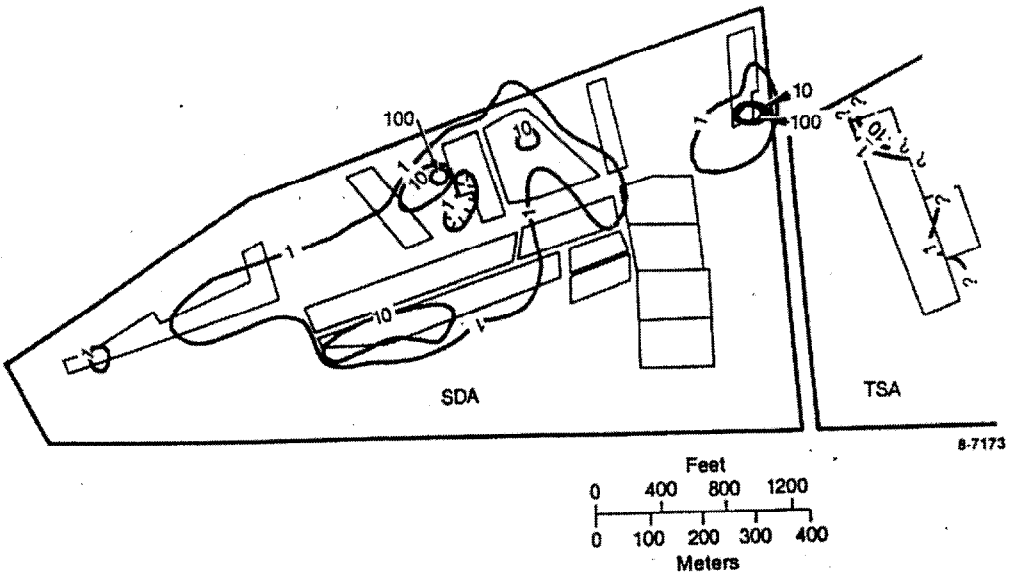


Figure 29. Isopleth map of the concentrations of trichloroethylene measured at the RWMC [units of micrograms per liter (µg/L)].

Appendix F

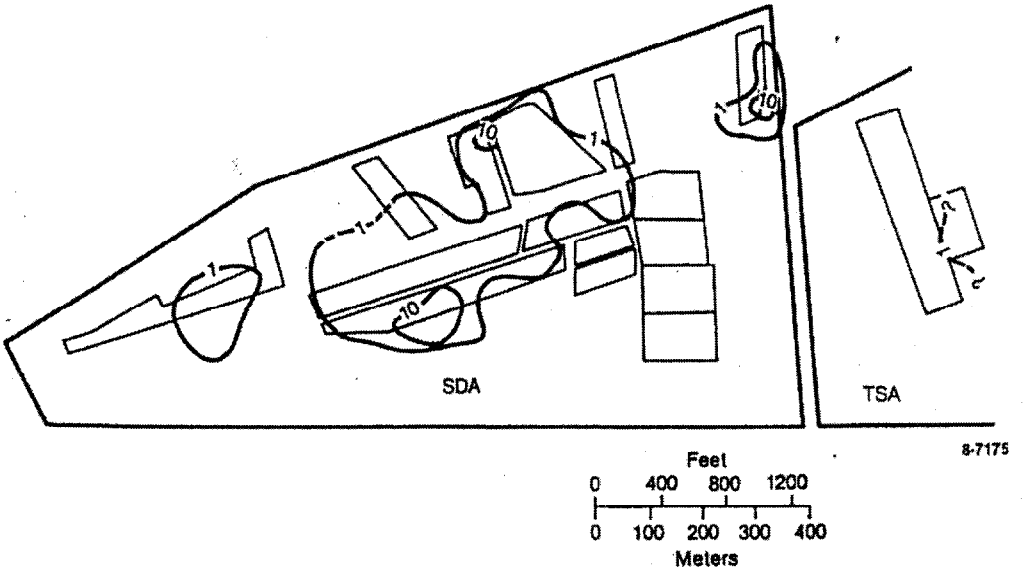


Figure 30. Isopleth map of the concentrations of tetrachloroethylene measured at the RWMC [units of micrograms per liter (µg/L)].

Results of 1987 Soil Gas Analyses

Converted from the original report's units of µg/L to ppm using a temperature of 20°C and a pressure of 0.84 atm.

Port Name	Sample Year	East	North	CT (ppm)	1,1,1-TCA (ppm)	TCE (ppm)	PCE (ppm)
B-02	1987	200	2400	0.06	0.00	0.00	0.01
B-04	1987	600	2400	0.07	0.00	0.01	0.01
B-06	1987	1000	2400	0.01	0.00	0.00	0.00
B-08	1987	1400	2400	0.19	0.00	0.01	0.01
B-10	1987	1800	2400	0.07	0.00	0.00	0.01
B-12	1987	2200	2400	0.13	0.00	0.00	0.00
B-14	1987	2600	2400	0.15	0.00	0.02	0.00
B-16	1987	3000	2400	0.04	0.00	0.01	0.00
B-18	1987	3400	2400	0.04	0.00	0.01	0.01
C-06	1987	1000	2200	0.07	0.00	0.00	0.01
C-08	1987	1400	2225	0.71	0.00	0.04	0.07
C-09	1987	1600	2200	0.37	0.00	0.00	0.01
C-10	1987	1800	2225	0.93	0.00	0.22	0.14
C-11	1987	2000	2200	1.04	0.00	0.09	0.01
C-12	1987	2200	2200	0.58	0.00	0.17	0.03
C-13	1987	2400	2200	0.19	0.00	0.00	0.00
C-14	1987	2600	2200	3.53	0.00	0.65	0.17
C-15	1987	2800	2200	0.37	0.00	0.00	0.07
C-16	1987	3000	2200	0.17	0.00	0.01	0.01
C-18	1987	3400	2200	0.28	0.00	0.01	0.02
C-19.5	1987	3700	2200	0.09	0.02	0.00	0.02
D-02	1987	200	2000	0.00	0.00	0.00	0.00
D-04	1987	600	2045	0.04	0.00	0.00	0.01
D-05	1987	800	2000	0.02	0.00	0.00	0.01
D-06	1987	1000	2000	0.02	0.00	0.01	0.03
D-07	1987	1200	2000	0.01	0.00	0.00	0.00
D-08	1987	1400	2000	0.00	0.21	0.00	0.00

Port Name	Sample Year	East	North	CT (ppm)	1,1,1-TCA (ppm)	TCE (ppm)	PCE (ppm)
D-09	1987	1600	2000	0.02	0.00	0.00	0.09
D-10	1987	1800	2000	0.07	0.00	0.02	0.02
D-11	1987	1925	2000	0.07	0.26	0.04	0.14
D-12	1987	2200	2000	0.19	0.00	52.18	0.00
D-14	1987	2600	2000	9.30	0.00	6.09	1.03
D-15	1987	2800	2000	0.37	0.00	0.00	0.00
D-16	1987	3000	2000	0.09	0.00	0.00	0.00
D-17	1987	3200	2000	0.06	0.00	0.00	0.00
D-18	1987	3400	2000	0.19	0.00	0.00	0.01
D-19	1987	3600	1975	0.87	0.00	0.24	0.69
E-02	1987	200	1800	0.00	0.00	0.00	0.00
E-03	1987	400	1800	0.00	0.28	0.13	0.17
E-04	1987	600	1800	0.00	0.43	0.87	0.01
E-05	1987	800	1800	0.00	0.26	0.00	0.03
E-06	1987	1000	1800	0.89	0.00	0.00	0.24
E-06	1987	1000	1800	2.23	3.22	2.61	0.41
E-07	1987	1200	1800	0.19	0.21	0.22	0.27
E-08	1987	1400	1800	0.22	0.19	0.87	0.10
E-09	1987	1600	1800	0.56	1.72	0.43	0.34
E-10	1987	1800	1800	0.37	0.21	0.00	0.00
E-11	1987	2000	1800	0.06	0.09	0.22	0.34
E-12	1987	2200	1800	0.00	0.00	0.00	0.00
E-14	1987	2600	1800	0.00	1.72	0.00	0.81
E-15	1987	2800	1800	0.00	66.51	0.87	0.00
E-15	1987	2800	1800	0.93	10.30	0.17	0.89
E-15	1987	2800	1800	0.00	36.47	0.35	1.03
E-15	1987	2800	1800	0.00	25.75	0.02	0.51
E-15	1987	2800	1800	0.00	60.07	0.70	1.20
E-16	1987	3000	1800	0.04	0.00	0.00	0.00
E-17	1987	3200	1800	0.37	0.00	0.00	0.00
E-18	1987	3400	1800	2.23	2.15	2.04	0.36

Port Name	Sample Year	East	North	CT (ppm)	1,1,1-TCA (ppm)	TCE (ppm)	PCE (ppm)
E-19	1987	3525	1800	185.94	0.00	32.61	6.87
E-19	1987	3525	1800	228.70	0.00	43.48	5.84
E-19	1987	3525	1800	260.31	0.00	21.74	4.29
E-19	1987	3525	1800	167.34	0.00	150.01	5.15
E-19	1987	3525	1800	119.00	0.00	17.39	3.43
E-19	1987	3525	1800	223.12	0.00	21.74	3.60
E-19.5	1987	3700	1825	0.06	0.00	0.00	0.00
F-02	1987	200	1600	0.02	0.00	0.00	0.00
F-03	1987	400	1625	0.04	0.00	0.00	0.12
F-04	1987	600	1575	0.00	0.00	0.00	0.00
F-05	1987	800	1600	0.00	0.00	0.00	0.00
F-06	1987	1000	1570	0.01	0.00	0.00	0.17
F-07	1987	1200	1600	0.02	0.00	0.00	0.12
F-08	1987	1400	1600	0.01	0.00	0.00	0.00
F-09	1987	1600	1600	0.37	1.72	0.43	0.34
F-10	1987	1800	1600	0.93	3.65	0.43	0.34
F-11	1987	2000	1600	0.19	2.79	0.22	0.51
F-12	1987	2200	1600	1.86	0.86	0.22	1.20
F-13	1987	2400	1600	5.39	0.00	0.87	0.34
F-14	1987	2600	1600	0.02	0.00	0.01	0.02
F-15	1987	2800	1600	2.42	0.00	0.65	0.34
F-17	1987	3200	1600	0.00	0.00	0.00	0.00
F-18	1987	3400	1600	0.00	0.43	0.22	0.01
G-04	1987	600	1400	0.01	0.00	0.00	0.00
G-05	1987	800	1400	0.00	0.00	0.00	0.00
G-06	1987	1000	1400	0.01	0.01	0.00	0.00
G-07A	1987	1200	1300	0.04	0.00	0.00	0.00
G-07B	1987	1200	1475	0.01	0.00	0.00	0.00
G-08	1987	1400	1400	0.07	0.00	0.04	0.01
G-09	1987	1600	1400	0.04	0.00	0.00	0.00
G-10	1987	1800	1425	4.28	0.00	1.52	2.06

Port Name	Sample Year	East	North	CT (ppm)	1,1,1-TCA (ppm)	TCE (ppm)	PCE (ppm)
G-11	1987	2000	1425	9.30	0.00	4.35	4.63
G-12	1987	2200	1420	0.45	0.54	0.33	0.07
G-13	1987	2400	1425	0.37	0.00	0.72	0.09
G-14	1987	2600	1400	0.37	0.00	0.04	0.03
G-15	1987	2800	1400	0.00	0.00	0.00	0.00
G-18	1987	3400	1400	0.01	0.01	0.00	0.03
H-06	1987	1000	1225	0.09	0.00	0.00	0.00
H-08	1987	1400	1200	0.00	0.00	0.00	0.00
H-09	1987	1600	1200	0.45	0.04	0.04	0.01
H-10	1987	1800	1200	0.37	0.00	0.02	0.01
H-11	1987	2000	1200	0.06	0.00	0.00	0.00
H-12	1987	2200	1200	0.19	0.00	0.17	0.17
H-13	1987	2400	1200	0.04	0.00	0.00	0.00
H-14	1987	2575	1150	0.00	0.00	0.00	0.00
H-15	1987	2800	1200	0.00	0.00	0.00	0.00
H-17	1987	3200	1200	0.00	0.86	0.00	0.03
H-18	1987	3400	1200	0.00	0.86	0.00	0.00
I-09	1987	1600	1000	0.74	0.00	0.04	0.01
I-11	1987	2000	1000	0.17	0.00	0.00	0.00
I-12	1987	2200	1000	0.06	0.15	0.00	0.00
I-13	1987	2400	1000	0.07	0.00	0.00	0.00
I-14	1987	2600	1000	0.20	0.00	0.00	0.00
I-14	1987	2600	1000	0.00	0.00	0.00	0.00
I-17	1987	3200	1000	0.00	0.64	0.00	0.01
I-18	1987	3400	1000	0.06	0.00	0.00	0.01
J-11	1987	2000	750	0.01	0.00	0.00	0.00
J-14	1987	2600	800	0.00	0.82	0.00	0.00
J-15	1987	2800	800	0.00	38.62	0.00	0.00
J-16	1987	3000	800	0.00	0.00	0.00	0.00
J-17	1987	3200	800	0.06	0.04	0.01	0.01
J-18	1987	3400	800	0.00	0.00	0.00	0.00

Port Name	Sample Year	East	North	CT (ppm)	1,1,1-TCA (ppm)	TCE (ppm)	PCE (ppm)
K-14	1987	2600	600	0.07	0.00	0.01	0.00
K-17	1987	3200	600	0.01	0.00	0.00	0.00
L-17	1987	3200	400	0.00	0.00	0.00	0.00
P03-1	1987	1950	1900	1.86	10.73	1.96	0.86
P04-1	1987	2500	1600	0.74	0.00	0.22	0.17
P04-2	1987	2300	1600	427.65	0.00	1.96	1.72
P08-1	1987	2950	1900	0.00	0.00	0.00	0.00
P09-1	1987	3500	1900	0.06	0.00	0.00	0.00
P09-2	1987	3510	1850	185.94	0.00	1.74	2.23
P10-1	1987	2400	1485	0.71	0.09	0.00	0.31
P10-2	1987	2000	1475	29.75	0.00	4.57	3.26
P10-3	1987	1800	1500	18.59	0.00	6.52	1.54
P10-3	1987	1800	1500	87.39	0.00	0.87	1.72
P10-4	1987	1600	1500	5.21	0.00	4.78	0.34
P13-1	1987	2200	1350	0.01	0.00	0.00	0.00
P18-1	1987	2900	1350	0.00	0.00	0.00	0.00
P18-2	1987	3125	1300	0.00	0.00	0.00	0.00
PA-1	1987	2350	1850	1.49	0.00	0.70	1.66
PA-2	1987	2350	1750	0.71	0.00	0.28	0.98
PA-3	1987	2425	1750	0.56	0.00	0.22	0.38
PA-4	1987	2300	1900	0.35	0.00	0.09	0.43
PA-5	1987	2275	2000	0.65	0.00	0.13	0.69
PA-6	1987	2350	2050	2.23	0.00	1.00	2.23
PA-7	1987	2425	2050	1.00	0.00	1.00	1.34
PC-1	1987	2400	1350	0.37	0.00	0.00	0.00

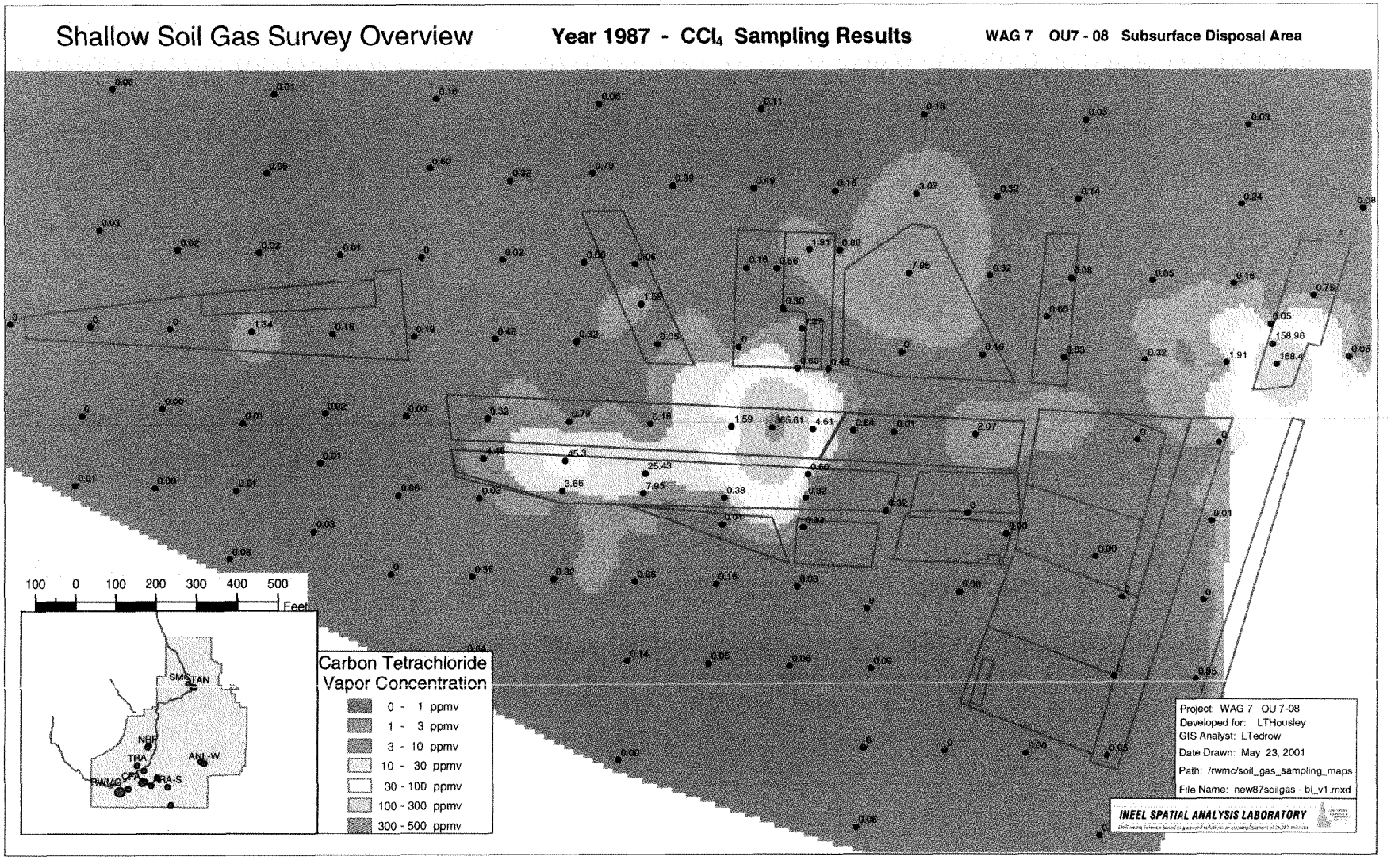


Figure A-1. Shallow soil-gas survey overview, Year 1987 $CC1_4$ sampling results.

Appendix B

1992 Shallow Soil-Gas Survey

THE CONTENTS OF THIS DOCUMENT ARE
THE HIGHEST QUALITY AVAILABLE.

INITIAL BRB DATE 5/23/94

EG&G Idaho, Inc
FORM EG&G-2631 (Rev. 12-88)

Project File Number OU-7-08

EDF Serial Number ERP-WAG7-09

Functional File Number

ENGINEERING DESIGN FILE

Project/Task EGG-WM-9834

Subtask Soil Gas/Shallow Well Gas Survey

EDF Page 1 of 18

Subject :Results of the Soil Gas Survey and Shallow Well Screening of the Radioactive Waste Management Complex Subsurface Disposal Area (SDA)

Abstract: This EDF summarizes the results of the January and February, 1992, sampling and analysis of 30" soil vapors throughout the RWMC SDA and soil vapors in shallow (<20 ft) selected wells in the SDA. Vapors were collected into Tedlar bags and analyzed on a portable gas chromatograph for the following compounds:

Carbon Tectrachloride
Trichlorethylene
Chloroform

The results of these analyses and identification of tentatively identified compounds (TICs) are identified in tables and isopleth maps.

Distribution (complete package)

Distribution (cover sheet only): Project EDF file log, EDF serial no. log

Author	Dept.	Reviewed	Date	Approved	Date
Isabel R. Anderson	F550	Isabel R. Anderson for Tyson Watson per telecon	5/15/92	Isabel R. Anderson for Todd Sullivan per telecon	5/15/92

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RESULTS OF THE SOIL GAS SURVEY AND SHALLOW WELL SCREENING OF THE RADIOACTIVE WASTE MANAGEMENT COMPLEX SUBSURFACE DISPOSAL AREA

1. INTRODUCTION AND SITE BACKGROUND

In January and February 1992, the Environmental Technology Unit performed a soil gas survey and shallow (<20 ft) well screening at the Radioactive Waste Management Complex (RWMC) Subsurface Disposal Area (SDA).

The purpose of this activity was to collect data regarding the presence of organic vapor contamination in surface soil at the SDA. The data will be used to guide further characterization studies (e.g., RI/FS), influence the evaluation of remedial measures, provide treatability information, and contribute to future risk assessments.

This document presents the results of a volatile organic vapor survey conducted in the SDA. The work was conducted in accordance with Organic Contamination Characterization (OCC) in the RWMC Vadose Zone (OU-7-08) Sampling and Analysis Plan (SAP), EGG-WM-9834, Rev. 0, August 1991 and DRR-ERP-464.

The SDA is underlain by surficial soils, thin sedimentary layers and thick basalt deposits. The surficial sediment deposits at the SDA in thickness from 1 ft to over 23 ft. The irregularities in the soil thickness generally reflect the surface of the underlying basalts. Generally, the surficial soils are shallow (i.e., <20 ft) and consist of gravelly sand and fine-grained eolian deposits. Most of the soil gas locations sampled were within backfill material of old waste disposal pits.

The SDA is a fenced area located at the RWMC (Figure 1-1). During the 1960s and early 1970s, prior to the passage of strict hazardous waste laws, barreled mixed wastes containing volatile organic compounds and radioactive wastes were buried at the SDA. Included in the SDA are numerous inactive and active waste disposal pits, trenches, soil vault rows, and Pad A. The inactive pits are backfilled excavations with a variety of dimensions . The active pits also vary in dimensions..

The volatile contaminant vapor plume beneath the SDA is believed to extend vertically from the ground surface to the surface of the groundwater at the depth of the aquifer (Golder and Associates, 1987), although the exact extent of the subsurface vapor plume is presently not well defined. This partial plume investigation was designed to give a current "snapshot" of the volatile organic compounds in subsurface vapor 30 in. below the ground surface (bgs) and at selected open well locations up to 20 ft bgs.

In 1987, a similar soil gas survey was performed in and around the SDA by Golder and Associates The results of this survey are documented in *Summary of Field Analytical Services Provided to EG&G, Idaho*, Golder Associates, 1987, Contract No. C87-131432. The survey detected 1,1,1-trichloroethane, tetrachloroethylene, trichloroethylene, and carbon tetrachloride at concentrations ranging from .01 - 1400 mg/m^3.

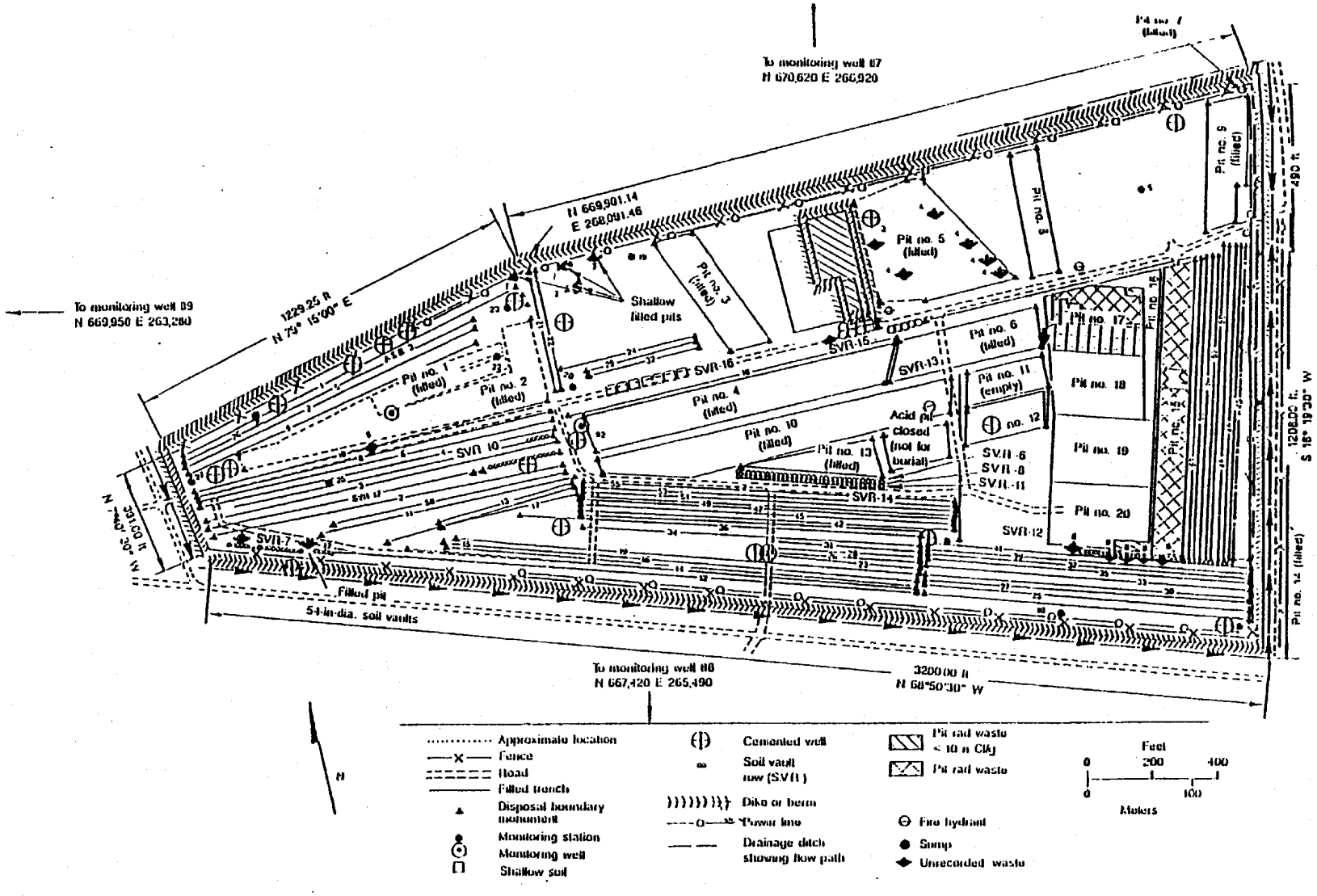

Figure 1-1. Map of the SDA.

2. SAMPLE COLLECTION PROCEDURES

A total of 91 soil gas survey locations within the SDA boundary were sampled during the soil gas survey (Figure 2-1). The SDA locations were an identical subset of the 144 locations sampled during the 1987 soil gas survey conducted by Golder and Associates. Samples were only taken from the interior of the SDA during this sampling effort based on the assumption that the isopleths would not extend beyond the boundaries of the SDA. The focus of this sampling effort was to obtain data from above and immediately around the waste pits. The engineering design file (EDF), Evaluation of Vapor Vacuum Monitoring and Testing Sites at the RWMC, ERP-VVED-065 (EG&G Idaho, 1991) was utilized to identify wells for shallow well screening. Twenty-six wells less than 20 ft. in depth were determined suitable for sampling (Figure 2-2).

Soil gas samples were collected by inserting a vapor probe into frozen soil 30 in. bgs. The external probe wall was sealed with clay at the ground surface to isolate the sampling point from the ambient air. Each location was purged for 30 seconds utilizing a vacuum box prior to collecting a sample. The vapors were then pulled into a Tedlar bag using the same vacuum box. Shallow well vapors were collected by dropping a Teflon tube to the bottom of selected wells, purging for 30 seconds, and collecting vapors into a Tedlar bag utilizing a vacuum box. Most samples were screened prior to analysis with a Microtip photoionization detector (PID) total organic vapor monitor prior to analysis on a portable gas chromatograph (GC) to determine approximate range of concentration. All samples were then analyzed within one half hour after collection using a portable GC set up in bldg. WMF-726 in accordance with Section 9.8 of the RWMC Operations and Maintenance Manual (O&MM).

The soil gas vapor sample collection procedure in the original SAP was modified for this project. Procedural changes and any other deviations from the SAP can be found in DRR-ERP-464.

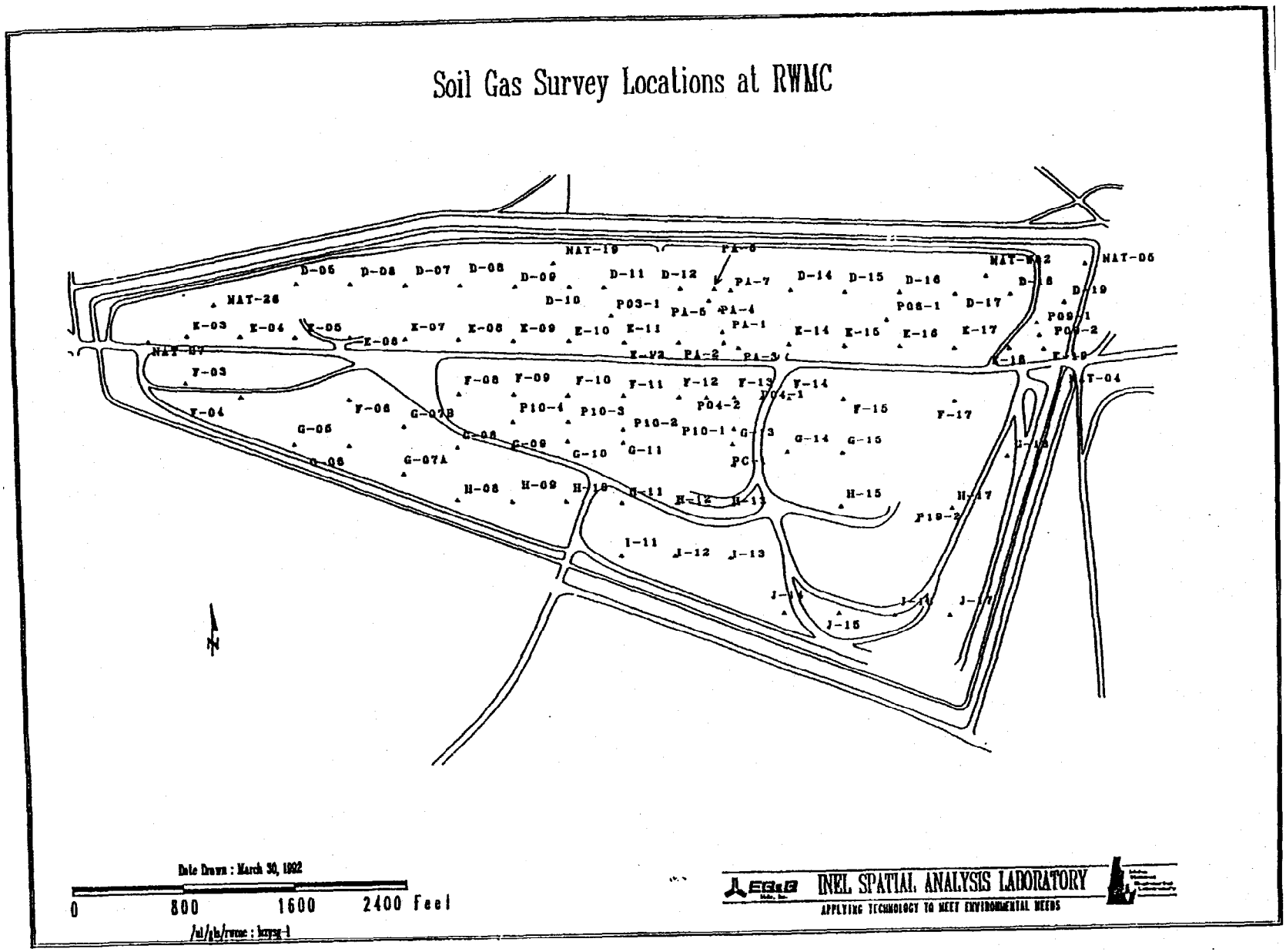

Figure 2-1. Soil Gas Sample Locations at the RWMC SDA (1992).

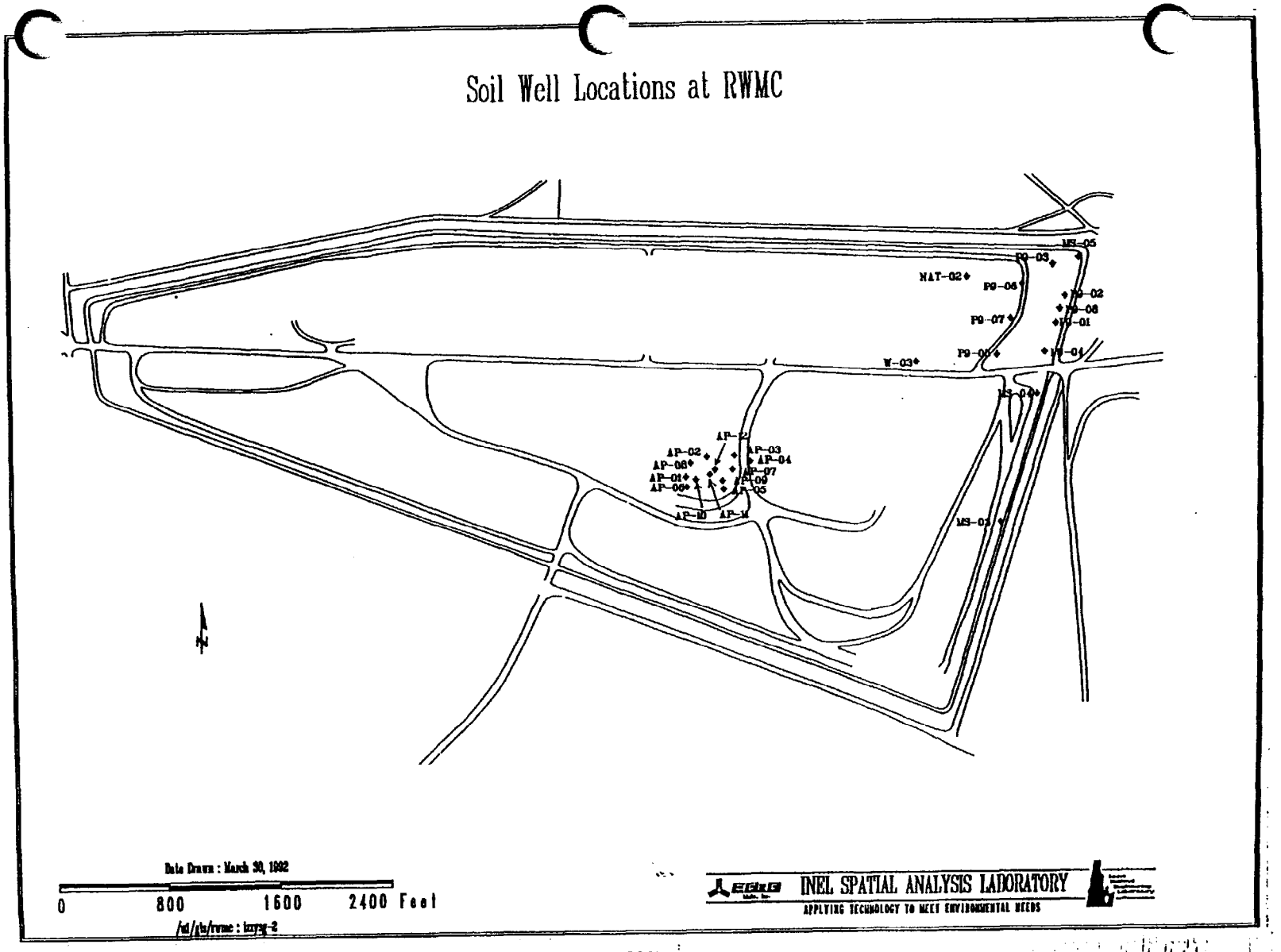

Figure 2-2. Shallow Well Gas Sample Locations at the RWMC SDA (1992).

3.1 Analytical Method

All samples were analyzed using a Sentex Sensing Technology, Inc. Scentograph portable GC in accordance with the Organic Contamination Characterization (OCC) in the RWMC Vadose Zone, Operable Unit (OU-7-08) SAP, Rev. 0 (EG&G Idaho, 1991). In addition to the method described in the SAP, the analytical method was standardized using following documents:

- Operator's Manual for Scentograph and Scentoscan (Sentex Sensing Technology, Inc., 1988)
- RWMC O&MM, VOL. 2. Procedure 9.8, Operation of the Gas Chromatograph

The vapor analyses generated analytical support Level II data and the data will be validated to Environmental Restoration Department (ERD) Level C per ERD SMO-SOP-12.11 following issuance and review of this document.

The GC was calibrated with a multicomponent certified calibration gas (Matheson) containing carbon tetrachloride (CCl_4) at 55 ppm, trichloroethylene (TCE) at 21 ppm, and chloroform at 6.6 ppm. The GC utilized an automatic sampling pump to draw the vapor sample from the Tedlar bag through a sample loop 1/8 in. dia. x 12 ft long packed GC column (Supleco 10% SP 1000 80/100 Supelcoport) heated to 100° C. An argon ionization detector was used to detect and quantify specific compounds eluting off the GC column.

Calibration/standardization was performed in the morning prior to analyzing samples, after every 10 samples analyzed, at the end of the sampling day, and whenever the GC accuracy was found to be greater than $\pm$ 20% of the "true" concentration of a field standard. The GC calibration records are part of the computer-logged information recorded during operation of the GC on file with all other records in the ERD Administrative Records and Document Control files.

The GC was also used to identify tentatively identified contaminants (TICs). TICs were identified by matching the retention time in the GC library to retention times for visible peaks on the chromatograph for each sample. TICs measured during this sampling effort were: Trans 1,2-Dichloroethylene, 1,1,2,2-Tetrachloroethylene, toluene and m-xylene.

In addition to the portable GC, portable alpha, and beta-gamma radiation meters, and a Photovac Microtip PID organic vapor monitor (11.7 eV lamp) were used in the field for health and safety precautions and to provide field screening data.

3.2 Analytical Results

It is important to note that results of soil gas surveys and shallow well screening provide only an indication of the relative amounts of volatile organic compounds (VOCs) in near surface soil gas at the RWMC SDA. They are not intended to nor do they provide a rigorous quantitative analysis of all the organic compounds present. The discussion of analytical results is divided into two sections. First, the results of the soil gas survey will be discussed, followed by a discussion of the well gas sample results.

3.2.1 Soil Gas Survey

Twenty-one out of 91 locations had positive analytical results for at least one of the calibrated compounds (Table 3-1 and Figures 3-1 through 3-3). Eight of these 21 locations also indicated the presence of TICs (Table 3-2). CCl_4 concentrations were highest in the southern end of Pit 9, with an elevated concentration measured on the east end of Pit 2. Notable VOC concentrations were also detected in Pits 10, 4, 6, 15, and 3 (Figure 1-1). TCE was detected in many of the locations registering positive CCl_4 values. Interestingly, the highest concentration for TCE was not found in Pit 9, but in Pit 2. Other locations measuring positive TCE values were Pit 10, 4, 6, 9, and Pad A. A sampling location just outside the southwest corner of Pit 10 registered positive for TCE: this area is historically registered as a waste trench or soil vault row (Figure 3-2). Chloroform was detected just outside the southwest corner of Pit 10 and in the southeast end of Pit 9 (Figure 3-3). TICs were not mapped due to their uncertainty of identification, but may be located by matching the values in Table 3-2 to Figure 2-1.

3.2.2 Shallow Well Screening

Twenty-six shallow wells were sampled (Figure 2-2), and 18 of these wells had positive analytical results for the calibrated compounds (Table 3-3). Four of these wells also showed positive values for TICs (Table 3-2). The majority of the wells sampled are located in and around the Acid Pit and around Pit 9. The remainder of the wells sampled are located on the east end of the SDA. Figure 3-4 is a map of the Acid pit wells and associated concentrations. Figure 3-5 is a map of Pit 9 wells and associated concentrations.

No isopleths of these locations are provided because the data collected from these wells is not comparable. Some of the wells have been in existence for several years (W-03, NAT-02, MS-03, MS-04, Ms-05, and NAT-06). The wells around the perimeter of Pit 9 and the Acid Pit were all drilled in December 1990. The interior Acid Pit wells were drilled in December 1991. All of the wells were drilled to the top of the first basalt flow, so none are the same depth. The shallow well survey was designed to be strictly qualitative in nature.

3.2.3 Quality Assurance Samples/GC Performance

Quality assurance (QA) samples were collected in accordance with the SAP. QA samples included replicates and duplicates to measure GC performance and sample collection repeatability. Table 3-4 is a compilation of QA samples collected.

Table 3-1. Soil Gas Sample Results - Calibrated Compounds (1992).

Location	Date/Time	Baro. (in. Hg)	* OVA (ppm)	** CCl4 (ppm)	CCl4 (mg/m3)	TCE (ppm)	TCE (mg/m3)	Chloro (ppm)	Chloro (mg/m3)
D19	29 JAN 1120	30.4+	1.5	3	18	1	5	ND	ND
P9-02	29 JAN 1213	30.4+	30	255	1599	6	33	4	20
E19	29 JAN 1222	30.4+	ND	14	89	3	18	ND	ND
E18	29 JAN 1237	30.4+	ND	ND	ND	ND	ND	ND	ND
P9-01	29 JAN 1247	30.4+	ND	2	9	ND	ND	ND	ND
E17	29 JAN 1331	30.4+	ND	ND	ND	ND	ND	ND	ND
D17	29 JAN 1349	30.4+	ND	ND	ND	ND	ND	ND	ND
D16	29 JAN 1406	30.4+	ND	ND	ND	ND	ND	ND	ND
E16	29 JAN 1427	30.4+	ND	ND	ND	ND	ND	ND	ND
F17	29 JAN 1447	30.4+	ND	ND	ND	ND	ND	ND	ND
G18	29 JAN 1514	30.4+	ND	ND	ND	ND	ND	ND	ND
D18	29 JAN 1532	30.4+	ND	ND	ND	ND	ND	ND	ND
P10-02	29 JAN 1554	30.4+	ND	ND	ND	2	8	ND	ND
NAT-05	30 JAN 0941	NA	ND	ND	ND	ND	ND	ND	ND
NAT-W02	30 JAN 1029	NA	ND	ND	ND	ND	ND	ND	ND
D15	30 JAN 1044	NA	0.1	ND	ND	ND	ND	ND	ND
D14	30 JAN 1119	NA	ND	ND	ND	ND	ND	ND	ND
E14	30 JAN 1137	NA	ND	ND	ND	ND	ND	ND	ND
E15	30 JAN 1354	NA	ND	ND	ND	ND	ND	ND	ND
F15	30 JAN 1438	NA	7.2	24	149	1	5	ND	ND
NAT-04	30 JAN 1539	NA	1.3	ND	ND	ND	ND	ND	ND
P9-01	3 FEB 0950	NA	2.6	ND	ND	ND	ND	ND	ND
P8-01	3 FEB 1028	NA	1.4	ND	ND	ND	ND	ND	ND
P4-01	3 FEB 1040	NA	3.4	20	127	3	16	ND	ND
F13	3 FEB 1107	NA	ND	1	9	ND	ND	ND	ND
P4-02	3 FEB 1117	NA	0.2	23	142	ND	ND	ND	ND
F12	3 FEB 1128	NA	ND	20	128	ND	ND	ND	ND
F11	3 FEB 1310	NA	ND	2	11	ND	ND	ND	ND
F10	3 FEB 1336	NA	ND	ND	ND	ND	ND	ND	ND
F09	3 FEB 1353	NA	ND	ND	ND	ND	ND	ND	ND
F08	3 FEB 1404	NA	ND	ND	ND	ND	ND	ND	ND
P10-04	3 FEB 1418	NA	ND	16	97	9	50	ND	ND
P10-03	3 FEB 1517	NA	ND	63	396	3	16	ND	ND
G10	3 FEB 1529	NA	ND	3	18	ND	ND	ND	ND
G11	3 FEB 1542	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-1. (continued).

Survey Location	Date/Time "1992"	Baro. Pres.	* OVA	** CCl4 (ppm)	CCl4 (mg/m3)	TCE (ppm)	TCE (mg/m3)	Chloro (ppm)	Chloro (mg/m3)
P10-02	3 FEB 1553	NA	ND	ND	ND	1	6	ND	ND
P9-02 BKGD	5 FEB 1016	23	ND	ND	ND	ND	ND	ND	ND
PA-5	5 FEB 1038	23	1.5	ND	ND	1	5	ND	ND
PA-6	5 FEB 1105	23	2.1	ND	ND	ND	ND	ND	ND
PA-7	5 FEB 1114	23	1.6	ND	ND	ND	ND	ND	ND
PA-1	5 FEB 1150	23	1.7	ND	ND	ND	ND	ND	ND
PA-2	5 FEB 1208	23	ND	ND	ND	ND	ND	ND	ND
PA-3	5 FEB 1215	23	ND	ND	ND	ND	ND	ND	ND
E12	5 FEB 1309	23	2	ND	ND	ND	ND	ND	ND
P3-01	5 FEB 1405	23	ND	ND	ND	ND	ND	ND	ND
P3-01 (OLD)	5 FEB 1415	23	1.5	4	23	ND	ND	ND	ND
E11	5 FEB 1430	23	ND	ND	ND	ND	ND	ND	ND
D10	5 FEB 1439	23	ND	ND	ND	ND	ND	ND	ND
D11	5 FEB 1455	23	ND	ND	ND	ND	ND	ND	ND
D12	5 FEB 1526	23	ND	ND	ND	ND	ND	ND	ND
NAT-19	5 FEB 1548	23	ND	ND	ND	ND	ND	ND	ND
F14	6 FEB 0959	25.1	4.2	2	12	ND	ND	ND	ND
G14	6 FEB 1030	25.1	2	ND	ND	ND	ND	ND	ND
G15	6 FEB 1045	25.1	ND	ND	ND	ND	ND	ND	ND
P19-02	6 FEB 1138	25.1	ND	ND	ND	ND	ND	ND	ND
H15	6 FEB 1220	25.1	ND	ND	ND	ND	ND	ND	ND
J17	6 FEB 1330	25.1	ND	ND	ND	ND	ND	ND	ND
J15	6 FEB 1418	25.1	ND	ND	ND	ND	ND	ND	ND
J14	6 FEB 1434	25.1	ND	ND	ND	ND	ND	ND	ND
I13	10 FEB 1118	24.8	ND	ND	ND	ND	ND	ND	ND
H13	10 FEB 1129	24.8	ND	ND	ND	ND	ND	ND	ND
H11	10 FEB 1149	24.8	ND	ND	ND	ND	ND	ND	ND
H10	10 FEB 1211	24.8	ND	ND	ND	ND	ND	ND	ND
H12	10 FEB 1246	24.8	ND	ND	ND	ND	ND	ND	ND
I12	10 FEB 1259	24.8	ND	ND	ND	ND	ND	ND	ND
I11	10 FEB 1333	24.8	ND	ND	ND	ND	ND	ND	ND
H09	10 FEB 1423	24.8	ND	ND	ND	ND	ND	ND	ND
G07A	10 FEB 1504	24.8	ND	ND	ND	ND	ND	ND	ND
H08	10 FEB 1513	24.8	ND	ND	ND	ND	ND	ND	ND
G05	10 FEB 1546	24.8	ND	ND	ND	ND	ND	ND	ND

Table 3-1. (continued).

Survey Location	Date/Time "1992"	Baro. Pres.	*	OVA **	CCl4 (ppm)	CCl4 (mg/m3)	TCE (ppm)	TCE (mg/m3)	Chloro (ppm)	Chloro (mg/m3)
G06	10 FEB 1554	24.8		ND	ND	ND	ND	ND	ND	ND
G08	11 FEB 1103	24.9		NA	ND	ND	7	36	7	32
G07B	11 FEB 1112	24.9		NA	ND	ND	ND	ND	ND	ND
G09	11 FEB 1119	24.9		NA	ND	ND	ND	ND	ND	ND
F04	11 FEB 1126	24.9		NA	ND	ND	ND	ND	ND	ND
F06	11 FEB 1154	24.9		NA	ND	ND	ND	ND	ND	ND
E03	11 FEB 1201	24.9		NA	ND	ND	ND	ND	ND	ND
F03	11 FEB 1208	24.9		NA	ND	ND	ND	ND	ND	ND
NAT-27	11 FEB 1252	24.9		NA	ND	ND	ND	ND	ND	ND
E04	12 FEB 0939	24.9		NA	ND	ND	ND	ND	ND	ND
E05	12 FEB 1037	24.9		NA	ND	ND	ND	ND	ND	ND
D05	12 FEB 1200	24.9		NA	ND	ND	ND	ND	ND	ND
D06	12 FEB 1209	24.9		NA	5	32	ND	ND	ND	ND
D07	12 FEB 1225	24.9		NA	ND	ND	ND	ND	ND	ND
NAT-26	12 FEB 1237	24.9		NA	ND	ND	ND	ND	ND	ND
D08	12 FEB 1343	24.9		NA	ND	ND	ND	ND	ND	ND
E07	12 FEB 1403	24.9		NA	111	696	52	277	ND	ND
E08	12 FEB 1441	24.9		NA	ND	ND	ND	ND	ND	ND
E06	12 FEB 1450	24.9		NA	ND	ND	ND	ND	ND	ND
E09	12 FEB 1508	24.8		NA	ND	ND	ND	ND	ND	ND
D09	12 FEB 1524	24.8		NA	ND	ND	ND	ND	ND	ND
E10	12 FEB 1535	24.8		NA	3	17	ND	ND	ND	ND
H17	19 FEB 1016	25		NA	7	43	ND	ND	ND	ND
J16	19 FEB 1025	25		NA	ND	ND	ND	ND	ND	ND
G13	19 FEB 1031	25		NA	ND	ND	ND	ND	ND	ND
CCl4 = Carbon Tetrachloride										
TCE = Trichloroethylene										
Chloro = Chloroform										
NA = Not Analyzed										
ND = None Detected										
OLD = Sampled from semi-permanent probe already in place										
* Barometric pressure not corrected for altitude										
** Organic vapor analyzer (Microtip PID w/11.7 eV lamp) Total VOCs										
+Barometric pressure corrected for altitude										

Table 3-2. Soil Gas and Shallow Well Gas Sample Results - Tentatively Identified Compounds (1992).

Survey Location	Date/Time	Baro. * (in. Hg)	OVA ** (ppm)	T1,2 DCE (ppm)	T1,2 DCE (mg/m3)	1,1,2,2 TCE (ppm)	1,1,2,2,TCE (mg/m3)	TOLUENE (ppm)	TOLUENE (mg/m3)	M-XYLENE (ppm)	M-XYLENE (mg/m3)
E19	29 JAN 1222	30.4+	ND	ND	ND	1.45	ND	ND	ND	ND	ND
P9-01	29 JAN 1247	30.4+	ND	ND	ND	0.09	ND	ND	ND	ND	ND
P10-2	29 JAN 1554	30.4+	ND	0.06	0.24	ND	ND	ND	ND	ND	ND
P9-02	3 FEB 0936	NA	30	ND	ND	ND	ND	2.47	9.29	2.13	9.23
P4-02	3 FEB 1117	NA	0.2	0.07	0.28	ND	ND	ND	ND	ND	ND
F11	3 FEB 1310	NA	ND	ND	ND	0.7	ND	ND	ND	ND	ND
P10-3	3 FEB 1517	NA	ND	ND	ND	7.11	ND	ND	ND	ND	ND
P10-2	3 FEB 1553	NA	ND	ND	ND	ND	ND	50.9	191.34	ND	ND
PA-5	5 FEB 1038	23	1.5	ND	ND	3.06	ND	ND	ND	ND	ND
P9-02 NOON	5 FEB 1253	23	11.3	ND	ND	1.88	ND	ND	ND	ND	ND
PA-5 DUP	5 FEB 1301	23	ND	ND	ND	2.95	ND	ND	ND	ND	ND
H13	10 FEB 1129	24.8	ND	ND	ND		ND	ND	ND	0.92	3.99
E07	12 FEB 1403	24.9	ND	ND	ND	46.39	ND	ND	ND	ND	ND
AP-3 (WELL)	19 FEB 1427	25	NA	ND	ND	ND	ND	2.91	10.94	ND	ND
P9-8 (WELL)	19 FEB 1554	25	3.3	ND	ND	1.08	ND	ND	ND	ND	ND
P9-5 (WELL)	19 FEB 1616	25	63.5	ND	ND	19.95	ND	ND	ND	ND	ND
AP-11 (WELL)	27 FEB 1301	25.3	NA	ND	ND	3.77	ND	ND	ND	ND	ND

T1,2-DCE - Trans 1,2, dichloroethylene

1,1,2,2-TCE - 1,1,2,2-tetrachloroethylene

DUP - Duplicate sample

NA - Not analyzed

ND - None detected

* Barometric pressure not corrected for altitude

** Organic vapor analyzer (Microtip PID w/11.7 eV lamp) Total VOCs

'+ Barometric pressure corrected for altitude

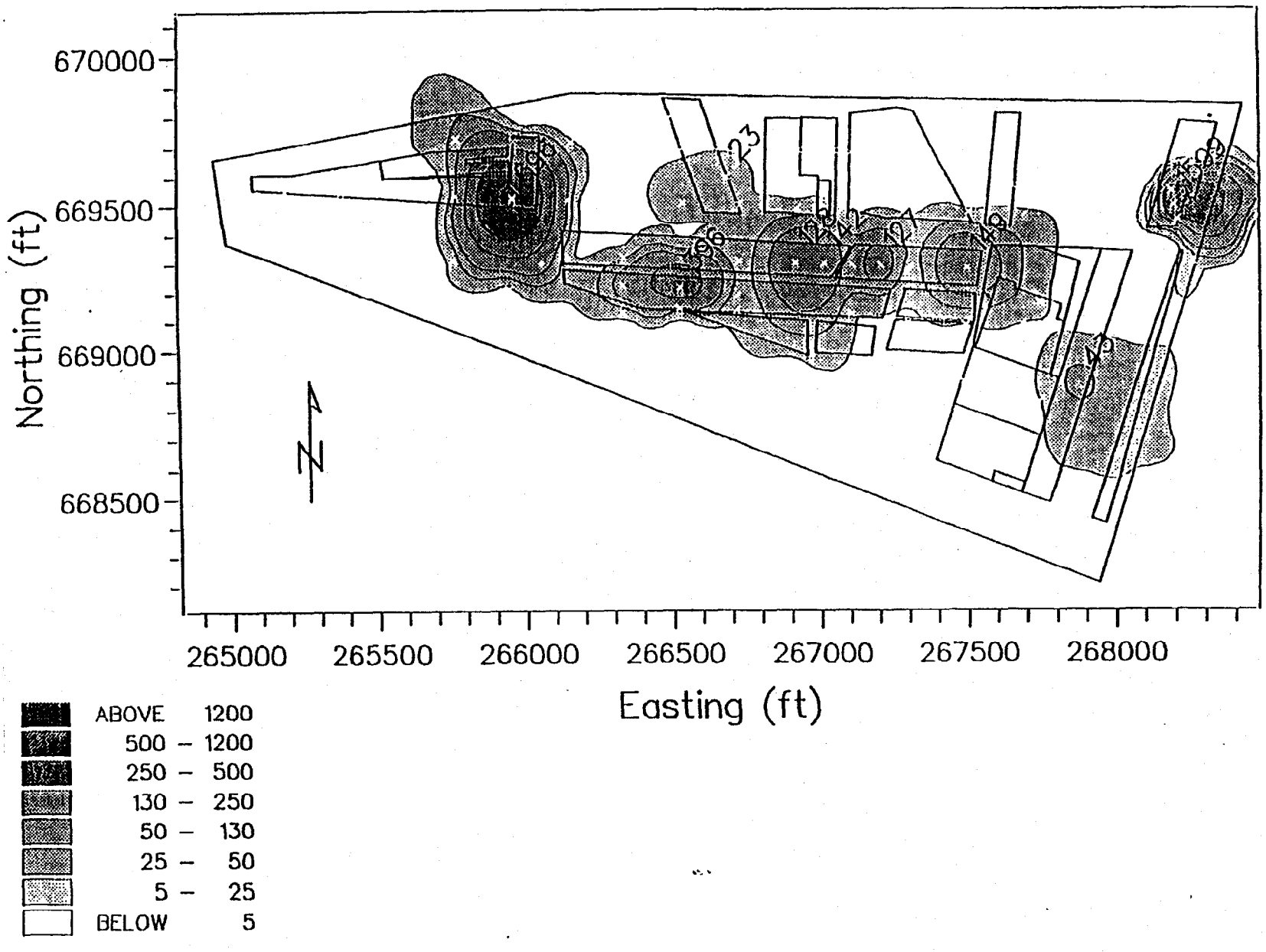

Figure 3-1. Isopleth of CCl4 Concentrations at the SDA (3) (1992).

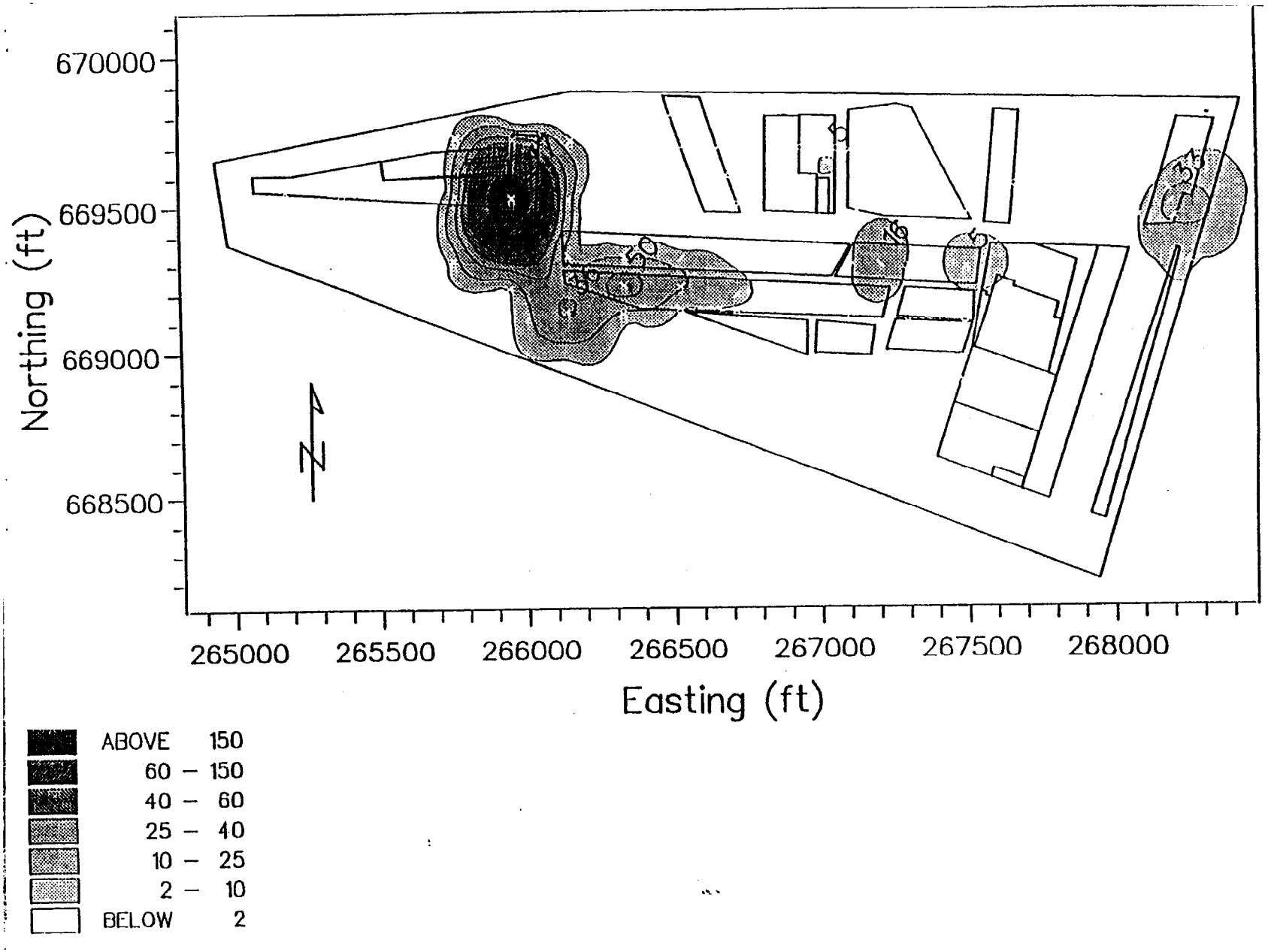

Figure 3-2. Isopleth of TCE Concentrations at the SDA (1992).

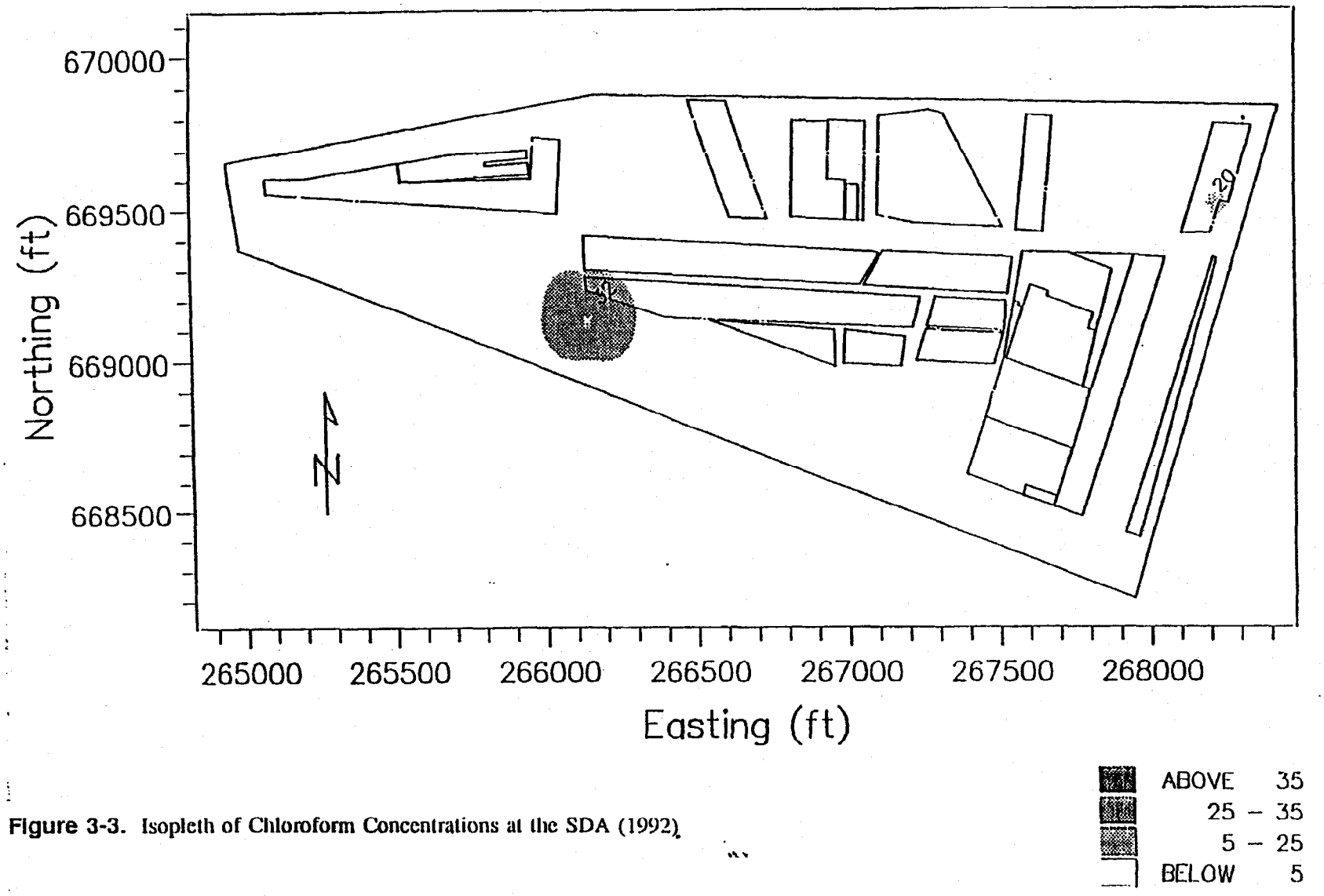

Figure 3-3. Isopleth of Chloroform Concentrations at the SDA (1992)

able 3-3. Shallow Well Gas Sample Results - Calibrated Compounds (1992).

Well Loc./ Depth (bgs)	Date/Time	Baro. * (in. Hg)	OVA ** (ppm)	CCl4 (ppm)	CCl4 (mg/m3)	TCE (ppm)	TCE (mg/m3)	Chloro (ppm)	Chloro (mg/m3)
AP-3/17'9"	19 FEB 1427	24.9	NA	ND	ND	ND	29	ND	ND
AP-5/22'9"	19 FEB 1441	24.9	NA	36	229	5	ND	ND	ND
AP-7/17'2"	19 FEB 1450	24.9	NA	3	17	ND	19	0	2
AP-4/19'6"	19 FEB 1459	24.9	NA	42	264	4	ND	ND	ND
AP-1/18'0"	19 FEB 1513	24.9	NA	8	49	ND	25	ND	ND
AP-6/18'11"	19 FEB 1530	24.9	NA	37	230	5	215	ND	ND
P9-1/22'0"	19 FEB 1554	24.9	53	158	990	40	16	ND	ND
P9-8/15'0"	19 FEB 1608	24.9	3.3	15	97	3	234	ND	ND
P9-5/22'9"	19 FEB 1616	24.9	63.5	196	1229	44	8	ND	ND
P9-4/18'0"	19 FEB 1624	24.9	ND	13	80	1	ND	ND	ND
P9-7/15'4"	19 FEB 1631	24.9	ND	18	114	ND	ND	ND	ND
P9-3/9'9"	19 FEB 1639	24.9	ND	ND	ND	ND	ND	ND	ND
AP-12/16'8"	27 FEB 1128	25.3	NA	ND	ND	ND	ND	ND	ND
AP-9/17'8"	27 FEB 1137	25.3	NA	1	4	ND	ND	ND	ND
AP-2/16'11"	27 FEB 1145	25.3	NA	2	15	ND	ND	ND	ND
AP-10/19'9"	27 FEB 1201	25.3	NA	ND	ND	ND	ND	ND	ND
AP-8/16'4"	27 FEB 1215	25.3	NA	ND	ND	ND	ND	4	17
AP-11/17'4"	27 FEB 1301	25.3	NA	0	3	ND	ND	ND	ND
W-03/10'6"	27 FEB 1341	25.3	NA	ND	ND	ND	ND	ND	ND
P9-6/7'8"	27 FEB 1349	25.3	NA	1	4	ND	ND	ND	ND
P9-7/15'4"	27 FEB 1402	25.3	NA	ND	ND	ND	ND	ND	ND
NAT-02/14'6"	17 MAR 1201	NA	NA	ND	ND	ND	ND	ND	ND
NAT-02 REP	17 MAR 1207	NA	ND	ND	ND	ND	ND	ND	ND
MS-03/10'6"	17 MAR 1233	NA	ND	ND	ND	ND	ND	ND	ND
MS-04/10'0"	17 MAR 1254	NA	ND	1	8	ND	ND	ND	ND
MS-05/9'0"	17 MAR 1305	NA	1.1	4	24	ND	ND	ND	ND
NAT-06/10'6"	17 MAR 1226	NA	ND	ND	ND	ND	ND	ND	ND
bgs = below ground surface									
NA = Not Analyzed									
ND = None Detected									
REP = Replicate Sample									
* Barometric pressure not corrected for altitude									
** Organic vapor analyzer (Microtip PID w/11.7 eV lamp) Total VOCs									
'+ Barometric pressure corrected for altitude									

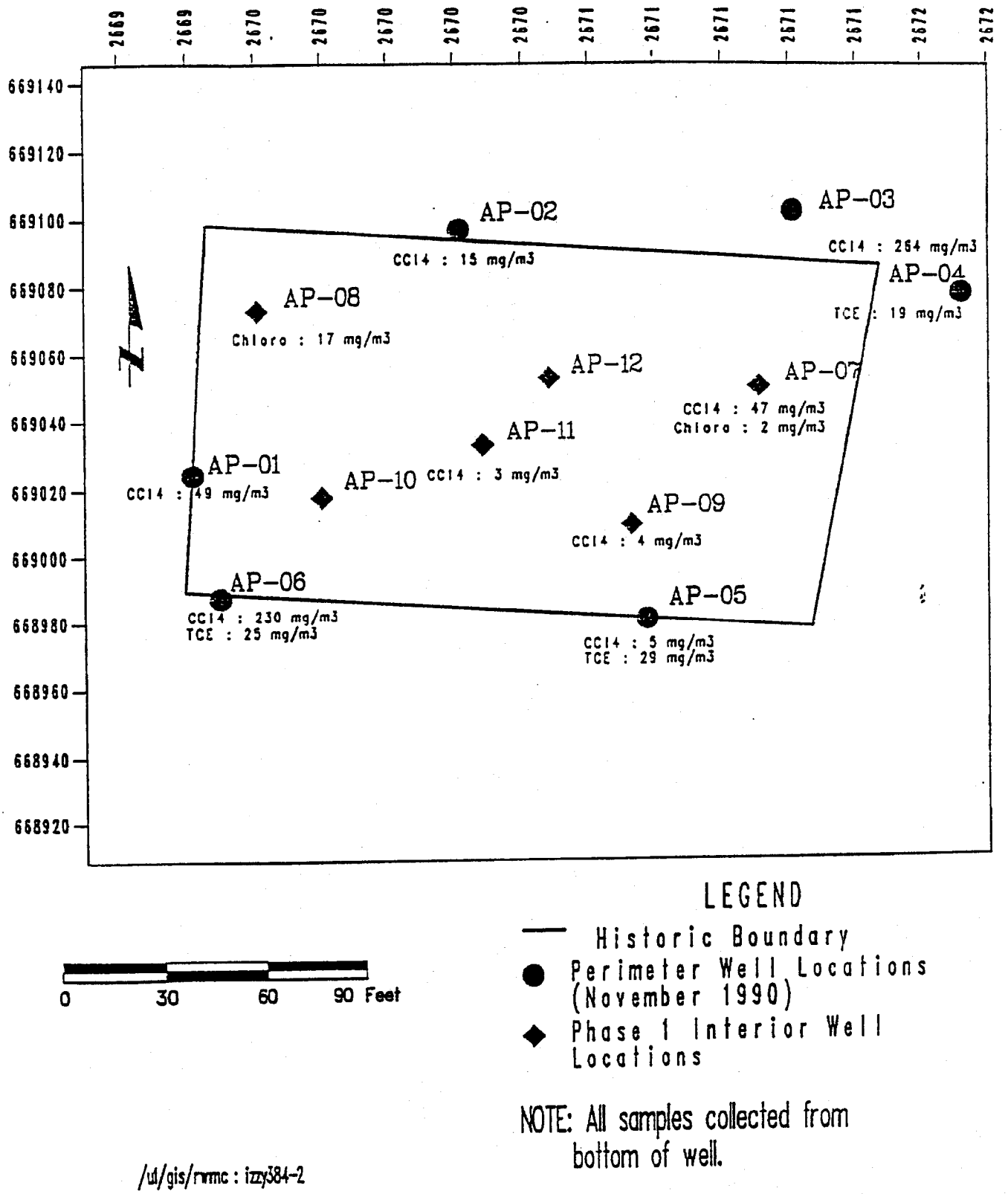

Figure 3-4. Shallow Well Gas Sample Results - Acid Pit (1992).

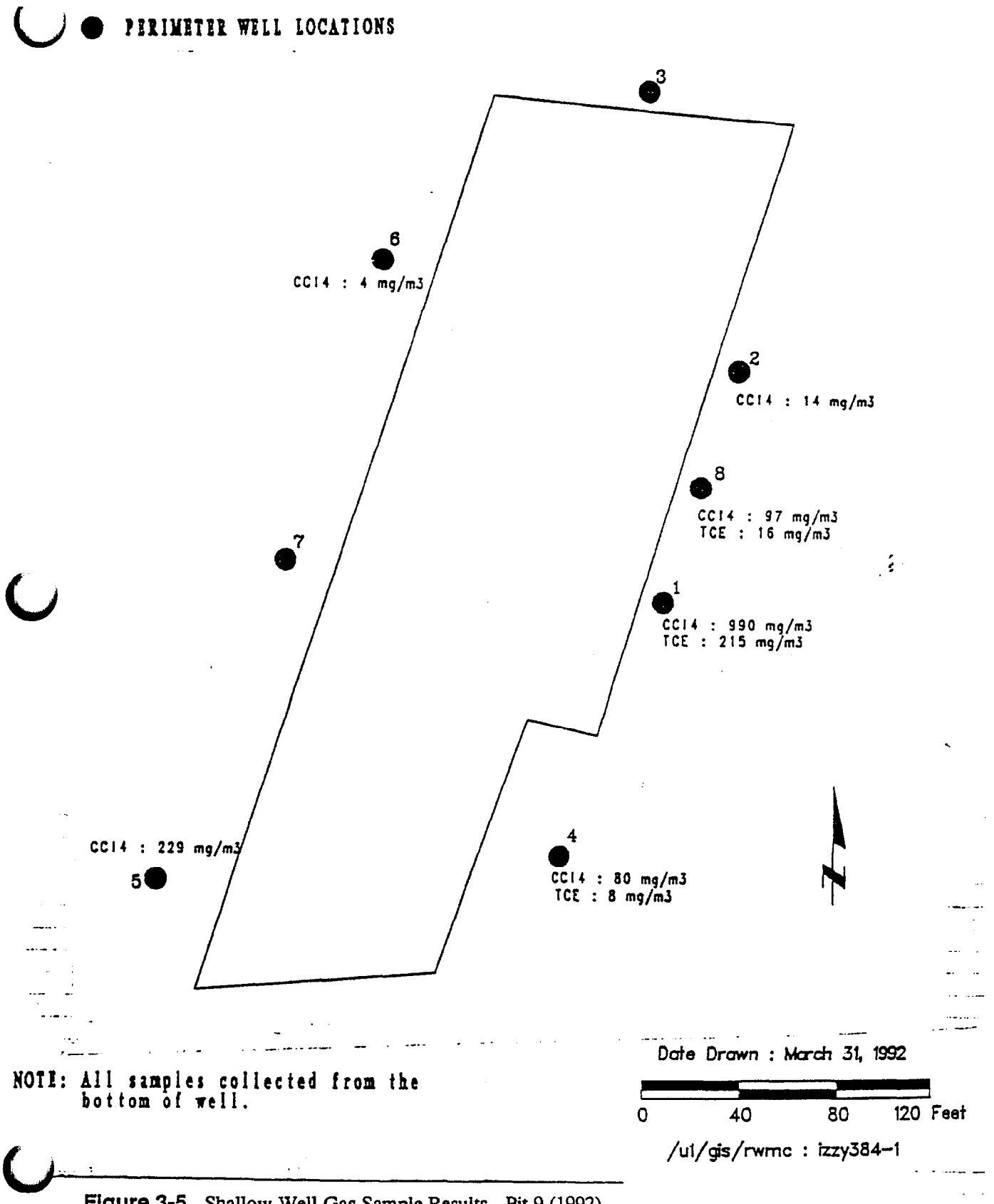

Figure 3-5. Shallow Well Gas Sample Results - Pit 9 (1992)

Table 3-4. QA Sample Results (1992).

Survey Location	Date/Time	Baro. * (in. Hg)	OVA ** (ppm)	CCl4 (ppm)	CCl4 (mg/m3)	TCE (ppm)	TCE (mg/m3)	Chloro (ppm)	Chloro (mg/m3)
P9-02 DUP	29 JAN 1419	30.4+	ND	244	1533	5	26	1	6
NAT-04 DUP	30 JAN 1603	NA	ND	ND	ND	ND	ND	ND	ND
P9-02	3 FEB 0936	NA	ND	63	394	2	12	ND	ND
P10-02 DUP	3 FEB 1601	NA	ND	ND	ND	1	4	ND	ND
P9-02 AM	5 FEB 1029	23	2.6	69	431	1	5	ND	ND
P9-02 NOON	5 FEB 1253	23	11.3	328	2056	14	76	17	82
PA-5 DUP	5 FEB 1301	23	ND	ND	ND	ND	ND	ND	ND
D11 REP	5 FEB 1504	23	ND	ND	ND	ND	ND	ND	ND
P9-02 PM	5 FEB 1516	23	39.9	287	1803	ND	ND	ND	ND
J17 DUP	6 FEB 1345	25.1	ND	ND	ND	ND	ND	ND	ND
H09 DUP	10 FEB 1436	24.8	ND	ND	ND	ND	ND	ND	ND
P9-02 AM	11 FEB 0928	24.9	NA	191	1198	ND	ND	ND	ND
P9-02AM REP	11 FEB 0936	24.9	NA	387	2431	6	32	ND	ND
E03 DUP	11 FEB 1215	24.9	NA	ND	ND	ND	ND	ND	ND
P9-02 NOON	11 FEB 1322	24.9	NA	148	926	ND	ND	ND	ND
P9-02 PM	11 FEB 1530	24.9	NA	340	2136	ND	ND	ND	ND
P9-02 AM	12 FEB 0814	24.9	NA	95	598	ND	ND	ND	ND
P9-02AM REP	12 FEB 0839	24.9	NA	240	1504	3	14	3	16
P9-02AM DUP	12 FEB 0853	24.9	NA	117	736	ND	ND	ND	ND
P9-02 NOON	12 FEB 1258	24.9	NA	183	1147	ND	ND	ND	ND
P9-02 PM	12 FEB 1544	24.8	NA	181	1134	ND	ND	ND	ND

CCl4 = Carbon Tetrachloride
TCE = Trichloroethylene
Chloro = Chloroform
AM = Morning sample
PM = Afternoon sample
DUP = Duplicate sample
REP = Replicate Sample
NA = Not analyzed
ND = None dectected
* Barometric pressure not corrected for altitude
** Organic vapor analyzer (Microtip PID w/11.7 eV lamp) Total VOCs
'+ Barometric pressure corrected for altitude

Appendix C

1999 Shallow Soil-Gas Survey

1999 Shallow Soil-Gas Survey over Burial Pits in the Subsurface Disposal Area

INTRODUCTION

Burial pits at the Subsurface Disposal Area (SDA) contain volatile organic compounds (VOCs). Historical dumping records give rough indication of the location within the pits where VOCs were placed. Several extraction methods have been employed to remove harmful gases emitted from the subsurface as a result of the decay and compromise of the barrels that contained these contaminants. This report describes an attempt to quantify concentrations of the gases at shallow depths over the pits through the analysis of gases taken from 30-in. vapor ports. The information attained from the analyses will be used to determine areas of relative high or low residual contaminants in the soil.

More than 250 30-in. vapor ports were installed over Pits 4, 6, and 10 at the SDA late in 1998 (see Figure 2 in the main body of this document). Each successfully installed port was sampled and the samples were analyzed on a photoacoustic gas analyzer.

PROCEDURES

Installation

Ports were installed using an electric hammer drill. Point tips were connected to Teflon tubing and to the ends of 3-ft drive rods. The rods, when connected to the hammer, pounded the tips into the soil. At 30 in., the hammer was removed and the rods were retracted using a handy-man jack, leaving the tips anchored in the soil. This procedure was used for the installation of each of the shallow vapor ports.

Sampling

In late January 1999, sampling was done of selected ports over Pits 4 and 6. Another round of sampling was conducted in late July 1999 and also included Pit 10. Sampling equipment consisted of a 10-L/minute Cole Parmer vacuum pump, a 12-V car battery with plug adapter, Tedlar gas sampling bags, and large plastic storage chests. Sampling took place between 8:00 AM and 12:00 PM on each day of collection. Samples were collected in groups of 60 to 100 and stored within the storage chests.

Sampling Protocol:

1. Record the required information on a new log section in the logbook
2. Purge port tubes for 1[1] second before filling Tedlar bags
3. Label Tedlar bags with the port identification, time of sampling, and date
4. Log the port identification, time of sampling, and date into the logbook
5. Log comments (if any) for the process in the logbook

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[1] Purge time was calculated assuming a total port length of 60-in. tube inside diameter of 3/16 in. and a vacuum of 10-L/minute. The actual purge time was calculated to be less than a second. The assumed purge time was rounded up for simplicity.

Transport

Samples were secured within plastic storage chests and within the transport vehicle. Samples were checked at the radiation control (RadCon) office before proceeding through the shift supervisor's desk. After screening for radiation from trained RadCon technicians, samples were transported to Central Facilities Area (CFA)-625, Room 140, for analysis.

Analysis

The Brüel and Kjaer (B&K) photoacoustic gas analyzer was used to quantify the concentration of six compounds in each of the samples. These were: chloroform, 1,1,1-trichloroethane, tetrachlorethene, trichloroethylene, carbon tetrachloride, and water. Equipment was set up and operated following the manufacturer and laboratory guidelines. Standard samples were analyzed previous to each analysis event (as stated in B&K instructions). Each field sample was analyzed. Reportable data included concentration data and sample information that included port identification, date, and time of sampling. Figure 3 in the main body of this document shows an isopleth map of CCl_4 concentrations from the July 1999 survey.

Materials and Equipment

- One Cole Parmer vacuum pump (vacuum at 10-L/minute)
- One 12-V car battery with plug adapter to power pump
- One hundred seventy five 1-L Tedlar sample bags
- One sample logbook
- Three plastic transport and storage chests for sample transport
- One B&K photoacoustic gas analyzer
- One computer to log B&K results
- Two standard carbon tetrachloride gas samples for B&K calibration.

Training

Personnel had the necessary training required to enter the SDA at the RWMC unescorted and perform work. As a minimum, this includes Rad Worker I, 40-hour Occupational Safety and Health Administration training, site access training, RWMC access training, and a familiarity with the procedures involved in collecting soil-gas samples.

Quality Assurance

The quality assurance measures for sampling involve checking each Tedlar bag to make sure they are completely empty before filling them with sample gas. It also includes purging the ports before taking samples, as well as completely closing the sample bag valves after collecting each sample.

The measures that were taken in the analysis of the samples involved checking the calibration of the B&K by using calibration gases. If the analyzed calibration gases were found to contain concentrations of gases within 20% of the actual value, then the B&K analysis was considered valid. Also, if any sample constituent other than water vapor exceeded 1,500-ppm, a blank (ambient air) sample was analyzed before proceeding to the next field sample to sufficiently purge the analyzer of any residual concentrations.

Data Reporting

The data obtained from the analysis of the soil-gas are presented in a spreadsheet within this report. For each port sampled, the concentrations of chloroform, 1,1,1-trichlorethene, tetrachloroethene, trichloroethene, carbon tetrachloride, and water are reported along with the date and time of sampling.

Table C-1. 1999 Soil-Gas Survey Port Locations.

Pits 4 & 6	NORTHING	EASTING	Point Name	Name	Pit 10	NORTHING	EASTING	Point Name	Name
	669364.6	267116.7	Pit 4 NE	Pit 4 NE		669274.19	266151.47	NW Corner	NW Corner
	669250.3	267053.4	Pit 4 SE	Pit 4 SE		669216.38	267250.57	NE Corner	NE Corner
	669372.9	266882.5	1-Z2	P4/6-B2		669120.27	267228.11	Intermediate	Intermediate
	669371.3	266912.4	1-Z3	P4/6-B3		669142.74	266421.16	SE Corner	SE Corner
	669369.8	266942.4	1-Z4	P4/6-B4		669208.26	266161.85	SW Corner	SW Corner
	669366.6	267002.3	1-Z6	P4/6-B6		669262.06	266157.19	2-A1	P10-A1
	669365.1	267032.3	1-Z7	P4/6-B7		669260.50	266187.16	2-A2	P10-A2
	669363.5	267062.2	1-Z8	P4/6-B8		669258.88	266217.13	2-A3	P10-A3
	669361.9	267092.2	1-Z9	P4/6-B9		669257.31	266247.06	2-A4	P10-A4
	669349.9	266881.3	1-A2	P4/6-C2		669255.75	266277.03	2-A5	P10-A5
	669348.3	266911.2	1-A3	P4/6-C3		669254.19	266307.00	2-A6	P10-A6
	669346.8	266941.2	1-A4	P4/6-C4		669252.63	266336.94	2-A7	P10-A7
	669345.2	266971.2	1-A5	P4/6-C5		669251.06	266366.91	2-A8	P10-A8
	669343.6	267001.1	1-A6	P4/6-C6		669249.50	266396.88	2-A9	P10-A9
	669342.1	267031.1	1-A7	P4/6-C7		669247.94	266426.81	2-A10	P10-A10
	669340.5	267061	1-A8	P4/6-C8		669246.38	266456.78	2-A11	P10-A11
	669326.9	266880.1	1-B2	P4/6-D2		669244.75	266486.75	2-A12	P10-A12
	669325.4	266910	1-B3	P4/6-D3		669241.63	266546.66	2-A14	P10-A14
	669323.8	266940	1-B4	P4/6-D4		669240.06	266576.63	2-A15	P10-A15
	669322.3	266969.9	1-B5	P4/6-D5		669238.50	266606.59	2-A16	P10-A16
	669320.7	266999.9	1-B6	P4/6-D6		669236.94	266636.53	2-A17	P10-A17
	669319.1	267029.8	1-B7	P4/6-D7		669235.38	266666.50	2-A18	P10-A18
	669317.5	267059.8	1-B8	P4/6-D8		669233.81	266696.47	2-A19	P10-A19
	669315.9	267089.8	1-B9	P4/6-D9		669232.19	266726.41	2-A20	P10-A20
	669304	266878.9	1-C2	P4/6-E2		669230.63	266756.38	2-A21	P10-A21
	669302.4	266908.8	1-C3	P4/6-E3		669229.06	266786.34	2-A22	P10-A22
	669300.8	266938.8	1-C4	P4/6-E4		669227.50	266816.28	2-A23	P10-A23
	669299.3	266968.8	1-C5	P4/6-E5		669225.94	266846.25	2-A24	P10-A24
	669297.7	266998.7	1-C6	P4/6-E6		669224.38	266876.22	2-A25	P10-A25
	669296.1	267028.7	1-C7	P4/6-E7		669222.81	266906.16	2-A26	P10-A26
	669294.6	267058.6	1-C8	P4/6-E8		669221.25	266936.13	2-A27	P10-A27
	669293	267088.6	1-C9	P4/6-E9		669219.63	266966.09	2-A28	P10-A28
	669281	266877.7	1-D2	P4/6-F2		669218.06	266996.03	2-A29	P10-A29
	669279.4	266907.6	1-D3	P4/6-F3		669216.50	267026.00	2-A30	P10-A30
	669277.9	266937.6	1-D4	P4/6-F4		669214.94	267055.97	2-A31	P10-A31
	669276.3	266967.5	1-D5	P4/6-F5		669213.38	267085.91	2-A32	P10-A32
	669274.8	266997.5	1-D6	P4/6-F6		669211.81	267115.88	2-A33	P10-A33
	669273.2	267027.5	1-D7	P4/6-F7		669238.06	266155.94	2-B1	P10-B1
	669271.6	267057.4	1-D8	P4/6-F8		669236.50	266185.91	2-B2	P10-B2
	669270	267087.4	1-D9	P4/6-F9		669234.94	266215.84	2-B3	P10-B3
	669258.1	266876.4	1-E2	P4/6-G2		669231.81	266275.78	2-B5	P10-B5
	669256.5	266906.4	1-E3	P4/6-G3		669230.25	266305.75	2-B6	P10-B6
	669254.9	266936.4	1-E4	P4/6-G4		669228.69	266335.69	2-B7	P10-B7
	669253.3	266966.3	1-E5	P4/6-G5		669227.06	266365.66	2-B8	P10-B8
	669251.8	266996.3	1-E6	P4/6-G6		669225.50	266395.63	2-B9	P10-B9
	669250.2	267026.3	1-E7	P4/6-G7		669223.94	266425.56	2-B10	P10-B10
	669248.6	267056.2	1-E8	P4/6-G8		669222.38	266455.53	2-B11	P10-B11

Table C-1. (continued).

Pits 4 & 6	NORTHING	EASTING	Point Name	Name	Pit 10	NORTHING	EASTING	Point Name	Name
	669247	267086.2	1-E9	P4/6-G9		669220.81	266485.50	2-B12	P10-B12
						669219.25	266515.44	2-B13	P10-B13
						669217.69	266545.41	2-B14	P10-B14
						669216.13	266575.38	2-B15	P10-B15
						669214.50	266605.31	2-B16	P10-B16
						669212.94	266635.28	2-B17	P10-B17
						669209.81	266695.19	2-B19	P10-B19
						669208.25	266725.16	2-B20	P10-B20
						669206.69	266755.13	2-B21	P10-B21
						669205.13	266785.06	2-B22	P10-B22
						669203.56	266815.03	2-B23	P10-B23
						669201.94	266845.00	2-B24	P10-B24
						669200.38	266874.97	2-B25	P10-B25
						669198.81	266904.91	2-B26	P10-B26
						669197.25	266934.88	2-B27	P10-B27
						669195.69	266964.84	2-B28	P10-B28
						669194.13	266994.78	2-B29	P10-B29
						669192.56	267024.75	2-B30	P10-B30
						669191.00	267054.72	2-B31	P10-B31
						669189.44	267084.66	2-B32	P10-B32
						669187.81	267114.63	2-B33	P10-B33
						669212.56	266184.66	2-C2	P10-C2
						669209.38	266244.56	2-C4	P10-C4
						669207.81	266274.53	2-C5	P10-C5
						669206.25	266304.47	2-C6	P10-C6
						669204.69	266334.44	2-C7	P10-C7
						669203.13	266364.41	2-C8	P10-C8
						669201.56	266394.34	2-C9	P10-C9
						669200.00	266424.31	2-C10	P10-C10
						669198.44	266454.28	2-C11	P10-C11
						669196.81	266484.22	2-C12	P10-C12
						669195.25	266514.19	2-C13	P10-C13
						669193.69	266544.16	2-C14	P10-C14
						669192.13	266574.09	2-C15	P10-C15
						669190.56	266604.06	2-C16	P10-C16
						669189.00	266634.03	2-C17	P10-C17
						669187.44	266664.00	2-C18	P10-C18
						669185.88	266693.94	2-C19	P10-C19
						669184.25	266723.91	2-C20	P10-C20
						669182.69	266753.88	2-C21	P10-C21
						669181.13	266783.81	2-C22	P10-C22
						669179.56	266813.78	2-C23	P10-C23
						669178.00	266843.75	2-C24	P10-C24
						669176.44	266873.69	2-C25	P10-C25
						669174.88	266903.66	2-C26	P10-C26
						669173.31	266933.63	2-C27	P10-C27
						669171.75	266963.56	2-C28	P10-C28

Table C-1. (continued).

Pits 4 & 6	NORTHING	EASTING	Point Name	Name	Pit 10	NORTHING	EASTING	Point Name	Name
						669170.13	266993.53	2-C29	P10-C29
						669168.56	267023.50	2-C30	P10-C30
						669167.00	267053.44	2-C31	P10-C31
						669183.88	266273.25	2-D5	P10-D5
						669182.31	266303.22	2-D6	P10-D6
						669180.75	266333.19	2-D7	P10-D7
						669179.13	266363.13	2-D8	P10-D8
						669177.56	266393.09	2-D9	P10-D9
						669176.00	266423.06	2-D10	P10-D10
						669174.44	266453.03	2-D11	P10-D11
						669172.88	266482.97	2-D12	P10-D12
						669169.75	266542.91	2-D14	P10-D14
						669168.19	266572.84	2-D15	P10-D15
						669166.56	266602.81	2-D16	P10-D16
						669165.00	266632.78	2-D17	P10-D17
						669163.44	266662.72	2-D18	P10-D18
						669161.88	266692.69	2-D19	P10-D19
						669160.31	266722.66	2-D20	P10-D20
						669158.75	266752.59	2-D21	P10-D21
						669157.19	266782.56	2-D22	P10-D22
						669155.63	266812.53	2-D23	P10-D23
						669152.44	266872.44	2-D25	P10-D25
						669150.88	266902.41	2-D26	P10-D26
						669149.31	266932.34	2-D27	P10-D27
						669147.75	266962.31	2-D28	P10-D28
						669146.19	266992.28	2-D29	P10-D29
						669144.63	267022.25	2-D30	P10-D30
						669153.63	266391.84	2-E9	P10-E9
						669152.06	266421.81	2-E10	P10-E10
						669150.50	266451.75	2-E11	P10-E11
						669148.94	266481.72	2-E12	P10-E12
						669147.31	266511.69	2-E13	P10-E13
						669145.75	266541.63	2-E14	P10-E14
						669144.19	266571.59	2-E15	P10-E15
						669142.63	266601.56	2-E16	P10-E16
						669141.06	266631.50	2-E17	P10-E17
						669139.50	266661.47	2-E18	P10-E18
						669137.94	266691.44	2-E19	P10-E19
						669136.38	266721.41	2-E20	P10-E20
						669134.75	266751.34	2-E21	P10-E21
						669133.19	266781.31	2-E22	P10-E22
						669131.63	266811.28	2-E23	P10-E23
						669128.50	266871.19	2-E25	P10-E25
						669126.94	266901.16	2-E26	P10-E26
						669125.38	266931.09	2-E27	P10-E27
						669123.81	266961.06	2-E28	P10-E28
						669122.19	266991.03	2-E29	P10-E29
						669120.63	267020.97	2-E30	P10-E30

Table C-2. Pits 4 and 6 Shallow Vapor Port Sampling Results (ppmv) January 1999

Port Name	CHCl3	1,1,1-TCA	PCE	TCE	CCl4	H2O
P4/6-C2	9.66E+01	3.06E+01	1.85E+01	3.09E+01	3.75E+02	1.37E+04
P4/6-C3	1.42E+02	4.21E+01	1.83E+01	2.99E+01	1.16E+03	1.15E+04
P4/6-C4	2.39E+02	4.48E+01	1.19E+01	1.49E+01	2.57E+03	1.03E+04
P4/6-C5	3.95E+02	9.01E+01	4.23E+01	3.45E+01	3.57E+03	1.12E+04
P4/6-C6	2.18E+01	6.54E-00	2.02E-00	6.76E+01	2.59E+02	8.69E+03
P4/6-C7	1.29E+02	2.59E+01	1.83E+01	4.74E+02	3.74E+02	9.65E+03
P4/6-C8	5.93E+02	1.14E+02	4.53E+01	4.80E+02	3.79E+03	1.22E+04
P4/6-C9	1.52E+01	2.09E-00	1.14E-01	1.35E+01	7.86E+01	2.10E+04
P4/6-D2	5.49E-00	1.83E-00	9.26E-01	5.29E-00	3.35E+01	7.77E+03
P4/6-D3	1.08E+02	3.74E+01	1.01E+01	2.02E+01	8.66E+02	9.22E+03
P4/6-D4	5.80E+01	1.00E+01	2.74E-00	1.39E+01	5.09E+02	8.59E+03
P4/6-D5	1.46E+01	2.89E-00	1.59E-00	1.35E+01	1.29E+02	2.49E+04
P4/6-D6	6.87E+01	2.59E+01	5.79E-00	1.40E+02	5.51E+02	1.05E+04
P4/6-D7	1.12E+02	2.51E+01	1.79E+01	2.90E+02	1.76E+02	1.06E+04
P4/6-D8	1.25E+02	2.56E+01	8.44E-00	7.24E+01	8.45E+02	9.39E+03
P4/6-D9	6.49E+01	6.82E-00	1.10E-00	2.37E+01	2.17E+02	8.59E+03
P4/6-E2	2.14E+01	6.63E-00	3.97E-00	1.16E+01	1.08E+02	1.55E+04
P4/6-E3	3.64E+01	1.14E+01	4.09E-00	1.05E+01	2.53E+02	1.01E+04
P4/6-E4	4.58E+01	9.47E-00	3.41E-00	1.21E+01	2.94E+02	1.01E+04
P4/6-E5	5.81E+01	1.36E+01	1.23E-00	1.72E+01	6.81E+02	9.89E+03
P4/6-E6	3.15E+01	2.07E+01	2.30E-00	2.42E+01	4.87E+02	9.60E+03
P4/6-E7	3.12E+01	7.37E-00	3.78E-00	4.80E+01	1.36E+02	8.63E+03
P4/6-E8	3.15E-00	5.73E-01	5.03E-01	6.41E-00	1.54E+01	8.67E+03
P4/6-E9	1.73E+01	2.69E-00	1.18E-00	2.76E+01	1.07E+02	2.52E+04
P4/6-F2	2.31E-00	6.97E-01	8.50E-01	3.21E-00	1.17E+01	1.33E+04
P4/6-F3	5.63E-00	1.85E-00	1.28E-00	3.98E-00	1.96E+01	8.62E+03
P4/6-F5	1.20E+01	3.43E-00	1.32E-00	4.84E-00	7.75E+01	7.36E+03
P4/6-F6	1.36E+01	3.13E-00	7.62E-01	6.27E-00	1.02E+02	8.17E+03
P4/6-F7	3.86E+01	1.67E+01	-2.19E-01	3.61E+01	9.22E+02	7.60E+03
P4/6-F8	8.55E-00	2.90E-00	1.07E-03	1.07E+01	1.34E+02	7.68E+03
P4/6-F9	2.86E+01	9.79E-00	1.28E-01	1.20E+01	1.84E+02	8.27E+03
P4/6-G3	1.79E-00	9.15E-01	2.66E-01	1.68E-00	7.84E-00	9.44E+03
P4/6-G4	1.70E-00	1.09E-00	2.74E-01	1.55E-00	6.22E-00	7.17E+03
P4/6-G5	3.39E-00	1.10E-00	5.77E-01	2.29E-00	1.66E+01	7.21E+03
P4/6-G6	3.35E-00	1.29E-00	4.28E-01	3.04E-00	3.09E+01	7.29E+03
P4/6-G7	9.44E-00	4.19E-00	8.11E-02	1.10E+01	1.74E+02	7.28E+03
P4/6-G8	6.15E-00	1.59E-00	3.73E-01	7.16E-00	5.56E+01	9.10E+03

Table C-3. Pits 4 and 6 Shallow Vapor Port Sampling Results (ppmv) July 27, 28, and 29, 1999

Port Name	CHCl3	1,1,1-TCA	PCE	TCE	CCl4	H2O
P4/6-C2	6.79E+01	1.24E+01	8.89E-00	1.62E+01	1.93E+02	1.32E+04
P4/6-C3	6.12E+01	5.29E-00	4.31E-00	7.82E-00	1.56E+02	1.33E+04
P4/6-C4	1.13E+02	7.42E-00	2.46E-00	1.12E+01	3.79E+02	1.30E+04
P4/6-C5	4.25E+02	4.32E+01	1.38E+01	2.35E+01	2.25E+03	1.35E+04
P4/6-C6	3.18E+01	3.61E-00	9.43E-01	6.90E+01	1.23E+02	1.30E+04
P4/6-C7	1.00E+02	4.67E-00	2.81E-00	3.14E+02	6.14E+01	1.34E+04
P4/6-C8	9.39E+01	6.96E-00	6.15E-01	8.11E+01	2.37E+02	1.32E+04
P4/6-D2	1.00E+01	1.29E-00	1.67E-00	5.87E-00	2.24E+01	1.30E+04
P4/6-D3	1.85E+01	2.30E-00	1.69E-00	3.50E-00	4.73E+01	1.32E+04
P4/6-D4	4.56E+01	3.24E-00	1.65E-00	5.02E-00	1.38E+02	1.32E+04
P4/6-D5	2.06E+02	2.41E+01	4.19E-00	1.90E+01	1.01E+03	1.35E+04
P4/6-D6	2.63E+01	3.35E-00	5.10E-01	3.97E+01	7.97E+01	1.31E+04
P4/6-D7	1.90E+02	1.69E+01	1.05E+01	6.84E+02	2.36E+02	1.36E+04
P4/6-D8	2.91E+02	1.35E+01	5.01E-00	1.89E+02	3.43E+02	1.35E+04
P4/6-D9	1.02E+02	9.07E-00	1.68E-00	5.23E+01	2.72E+02	1.34E+04
P4/6-E2	2.21E+01	3.72E-00	3.38E-00	1.75E+01	6.87E+01	1.29E+04
P4/6-E3	4.07E+01	8.43E-00	6.54E-00	1.02E+01	1.63E+02	1.25E+04
P4/6-E4	1.24E+01	1.89E-00	1.45E-00	4.25E-00	3.75E+01	1.26E+04
P4/6-E5	6.14E+01	9.02E-00	8.88E-01	1.32E+01	2.90E+02	1.24E+04
P4/6-E6	1.77E+01	3.29E-00	4.45E-01	1.45E+01	8.16E+01	1.23E+04
P4/6-E7	2.63E+01	4.43E-00	7.44E-01	3.54E+01	5.75E+01	1.26E+04
P4/6-E8	6.30E-00	2.48E-00	2.89E-01	3.83E-00	1.08E+01	1.27E+04
P4/6-E9	4.71E-00	2.45E-00	2.44E-01	4.21E-00	8.83E-00	1.30E+04
P4/6-F2	3.00E-00	7.82E-01	7.68E-01	2.25E-00	4.62E-00	1.28E+04
P4/6-F3	7.15E-00	1.74E-00	1.55E-00	4.13E-00	1.25E+01	1.25E+04
P4/6-F4	6.43E-00	1.42E-00	1.29E-00	2.59E-00	1.28E+01	1.24E+04
P4/6-F5	8.40E-00	1.50E-00	7.94E-01	3.96E-00	2.91E+01	1.24E+04
P4/6-F6	1.04E+01	9.22E-01	3.90E-01	4.23E-00	1.64E+01	1.24E+04
P4/6-F7	1.45E+01	2.40E-00	7.77E-02	1.01E+01	8.13E+01	1.21E+04
P4/6-F8	6.43E-00	1.00E-00	2.31E-01	6.38E-00	1.98E+01	1.26E+04
P4/6-F9	1.35E+01	1.98E-00	3.52E-01	8.60E-00	2.80E+01	1.23E+04
P4/6-G2	2.16E-00	5.01E-01	2.99E-01	1.17E-00	2.18E-00	1.25E+04
P4/6-G3	1.87E-00	3.61E-01	2.16E-01	1.05E-00	2.17E-00	1.25E+04
P4/6-G4	3.06E-00	8.92E-01	5.27E-01	1.24E-00	4.73E-00	1.24E+04
P4/6-G5	2.65E-00	1.25E-00	2.44E-01	1.27E-00	4.91E-00	1.24E+04
P4/6-G6	1.02E+01	2.92E-00	6.91E-01	5.89E-00	7.80E+01	1.25E+04
P4/6-G7	8.09E-00	2.09E-00	9.10E-02	6.75E-00	7.21E+01	1.26E+04
P4/6-G8	7.05E-00	2.43E-00	2.54E-01	3.49E-00	1.86E+01	1.27E+04

Table C-3. (continued).

Port Name	CHCl3	1,1,1-TCA	PCE	TCE	CCl4	H2O
P4/6-G9	6.89E-00	2.40E-00	2.46E-01	3.40E-00	1.75E+01	1.27E+04
P4/6-B2	1.70E+01	3.04E-00	2.90E-00	8.59E-00	5.60E+01	1.33E+04
P4/6-B3	7.34E+01	7.02E-00	4.81E-00	3.64E+01	2.52E+02	1.29E+04
P4/6-B4	1.47E+02	1.08E+01	4.19E-00	4.75E+01	6.99E+02	1.30E+04
P4/6-B6	6.45E+01	3.06E-00	1.12E-01	6.51E+01	1.62E+02	1.28E+04
P4/6-B7	1.89E+02	1.52E+01	4.45E-01	2.73E+02	6.86E+02	1.33E+04
P4/6-B8	1.55E+03	2.08E+02	7.85E+01	1.59E+03	7.26E+03	1.39E+04
P4/6-B9	4.94E+01	4.64E-00	-3.00E-01	3.63E+01	1.90E+02	1.35E+04

Appendix D

2000 Shallow Soil-Gas Survey

Appendix D

2000 Shallow Soil-Gas Survey

OVERVIEW

Through the use of a hydraulic power insertion probe, Teflon tubing ¼ in. in diameter was attached to a stainless steel driving tip. The tips, which are ventilated to allow the passage of air up through the tubing to the surface, were driven through the soil to a depth of 30 in. The insertion rod was retracted and the soil around the tubing collapsed. Workers compacted the soil further and added sand, followed by bentonite and water at the surface to adequately seal the space around the tube from the atmospheric air. Each tube was then cut off just above the surface, capped, and labeled. Later, each vapor port was sampled and retrieved in 1-L Tedlar bags. These samples were analyzed on a photoacoustic gas analyzer for five chlorinated solvents. These chlorinated compounds are: chloroform, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, and carbon tetrachloride. Carbon tetrachloride concentrations in soil gas measured during the 2000 shallow soil-gas survey are shown in Figure 5 of the main body of this document.

The initial installation of the shallow vapor ports for the 2000 activity occurred over the space of 3 months. The location and days spent installing ports were the following:

- Pit 4 on June 14 and 15, 2000
- Pits 4 and 6 on August 9, 2000
- Pit 10 on August 10, 2000
- Pit 5 on September 7, 2000.

Several of the vapor ports experienced damage because of other construction activities on the SDA. These damaged ports will be reinstalled when weather allows. Currently, tentative plans are to complete additional sampling from each of the ports to monitor changes in concentration. A grid containing 367 proposed sample port locations was developed for the 2000 soil-gas survey (see Figure 4 in the main body of this document). Sampling took place between August 15 to August 17, 2000, for ports installed over Pits 10, 4, and 6 (including transect ports). Sampling of ports installed over Pit 5 occurred on September 14, 2000.

Method for Installation: Operation of the 9600-P Powerprobe

The following is a guideline that was followed for operation of the hydraulic equipment used for insertion of the probes.

Before Using the Probe

- Read the operating manual and work documentation thoroughly before operating and understand how the system works.
- Check to make sure the hydraulic controls are off or in the neutral position before attempting to start the motor.

- Make certain the motor has sufficient hydraulic fluid, oil, and fuel. Check the dipstick for oil level in the motor and the fluid levels should be checked through the oil level sight glasses with the cylinder in the down position.
- Turn the hydraulic oil valve on. The lever should be in line with the hose.
- Be aware of the location of the emergency stop button.

Operating the System

Starting the system:

- Couple the four hydraulic hoses between the motor and the probe unit (fittings only allow for the proper way).
- Twist the emergency stop button "out" to place it in the run position.
- Switch the electric throttle to the idle position.
- Press and hold the electric choke button (if engine is cold).
- Turn the ignition key. When engine starts, release the electric choke button.
- Let the motor idle for a few minutes to warm up, then increase the idle to "fast" setting.
- Turn hydraulic lever to the left 90 degrees to pressurize the hoses.

Inserting the Tubing Using the Pushing Tools:

- Thread the driving head adapter onto the probe.
- Thread drive-rod extension to the drive head adapter.
- Thread the dedicated tip holder to the opposite end of the drive rod.
- Place the tip inside the tip holder. The O-ring should keep it in place.
- Drive the rod by pushing the lever arm down until the point is to the desired depth.
- Attach the Teflon tubing onto the barbed stem of the twist-to-lock connector.
- Insert tubing through the drive rod and screw the twist-to-lock connector to the tip.
- Unscrew the drive head adapter from the probe and drive rod and replace with the pull adapter.
- Retrieve drive rod by pushing the lever arm up until it comes to the surface.
- Backfill the hole around the tubing with sand.
- Cap the hole with approximately 3 to 4 in. of bentonite and apply water.

- Cut tubing to 4 in., or less, above the ground surface.
- Label the tube as a vapor port.
- Allow the radiation control technician to survey the equipment before moving on to next location.

Shutting Down the System

- Turn the ignition key to the off position.
- Turn hydraulic lever 90 degrees to the right (handle should be pointing toward you).
- Bleed any pressure from the hydraulic hoses by moving the lever until the pressure is gone.
- Detach hydraulic hoses from the probe and the motor and store on the spools. Replace necessary fluids.

Sampling

Samples were taken using a pump, fitted with adapters to fit the vapor ports. Each port was sampled and retrieved into a 1-L Tedlar bag. Insertion of the vapor ports continued over a 3 to 4 month period beginning in mid-June and ending in mid-September. Sampling each port occurred after 24 hours, but within 48 hours of installation. Samples were screened for radiation before exiting the area.

Analysis

Samples were analyzed, as they were in 1999, using a Brüel and Kjaer photoacoustic gas analyzer. Analysis was performed within 48 hours of the sample being taken. Concentrations were recorded for chloroform, 1,1,1-trichloroethane, tetrachloroethene, trichloroethene, carbon tetrachloride, and water vapor, and are included in the following data table.

Table D-1. Sampling results of shallow gas survey (ppmv), summer 2000.

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P10-A8	266366.91	669251.06	9.99E+01	1.73E+01	6.10E+01	1.52E+02	4.12E+02	7.26E+03
P10-A9	266396.88	669249.50	1.39E+02	2.18E+01	8.18E+01	1.46E+02	4.83E+02	7.19E+03
P10-A10	266426.81	669247.94	5.51E+01	3.40E+01	3.49E+01	5.13E+01	3.73E+02	7.00E+03
P10-A11	266456.78	669246.38	2.79E+01	1.04E+01	2.08E+01	2.91E+01	1.18E+02	6.43E+03
P10-A12	266486.75	669244.75	5.31E+01	1.87E+01	7.74E+01	8.98E+01	3.44E+02	6.73E+03
P10-A13	266516.69	669243.19	7.57E+01	3.23E+01	5.01E+01	1.40E+02	7.85E+02	6.99E+03
P10-A14	266546.66	669241.63	2.53E+01	1.15E+01	1.55E+01	4.43E+01	1.71E+02	6.10E+03
P10-A15	266576.63	669240.06	2.46E+01	1.78E+01	7.65E+00	2.02E+01	8.58E+01	6.31E+03
P10-A16	266606.59	669238.50	2.93E+01	1.52E+01	6.98E+00	1.67E+01	6.08E+01	5.60E+03
P10-A17	266636.53	669236.94	1.36E+01	6.63E+00	5.07E+00	1.00E+01	2.01E+01	6.11E+03
P10-A18	266666.50	669235.38	1.45E+01	1.03E+01	1.30E+01	3.37E+01	1.29E+01	6.36E+03
P10-B18	266665.25	669211.38	2.59E+01	9.19E+00	6.57E+00	2.07E+01	4.29E+01	6.06E+03
P10-B17	266635.28	669212.94	3.46E+01	1.39E+01	9.54E+00	2.62E+01	8.00E+01	6.14E+03
P10-B16	266605.31	669214.50	7.02E+01	2.84E+01	1.72E+01	4.32E+01	1.57E+02	5.69E+03
P10-B15	266575.38	669216.13	5.11E+01	3.15E+01	2.25E+01	4.71E+01	1.90E+02	5.74E+03
P10-B14	266545.41	669217.69	6.42E+01	3.13E+01	6.82E+01	6.15E+01	2.34E+02	5.90E+03
P10-B13	266515.44	669219.25	6.51E+01	2.03E+01	3.09E+01	1.32E+02	4.28E+02	5.50E+03
P10-B12	266485.50	669220.81	4.36E+01	1.20E+01	3.35E+01	1.25E+02	3.72E+02	5.94E+03
P10-B11	266455.53	669222.38	4.18E+00	9.22E-01	5.65E+00	9.58E+00	2.02E+01	5.23E+03
P10-B10	266425.56	669223.94	5.61E+01	2.52E+01	4.05E+01	6.40E+01	3.73E+02	5.32E+03
P10-B9	266395.63	669225.50	5.40E+01	1.21E+01	5.11E+01	6.95E+01	4.24E+02	5.49E+03
P10-B8	266365.66	669227.06	7.04E+01	1.27E+01	3.55E+01	1.23E+02	3.32E+02	5.98E+03
P10-C8	266334.44	669204.69	3.47E+01	7.90E+00	1.80E+01	7.68E+01	2.60E+02	5.24E+03
P10-C9	266394.34	669201.56	2.77E+01	6.97E+00	2.57E+01	4.30E+01	2.58E+02	5.59E+03
P10-C10	266424.31	669200.00	4.73E+01	1.49E+01	2.95E+01	5.41E+01	3.92E+02	5.39E+03
P10-C11	266454.28	669198.49	3.17E+01	1.14E+01	2.25E+01	4.11E+01	2.09E+02	5.58E+03
P10-C12	266484.22	669196.81	6.51E+01	3.01E+01	4.19E+01	1.19E+02	4.70E+02	5.61E+03
P10-C13	266514.19	669195.25	6.62E+01	2.19E+01	3.27E+01	1.64E+02	3.86E+02	6.05E+03
P10-C14	266544.16	669193.69	7.86E+01	3.60E+01	3.97E+01	9.98E+01	2.97E+02	5.47E+03
P10-C15	266574.09	669192.13	8.56E+01	3.71E+01	3.96E+01	8.94E+01	3.00E+02	5.89E+03
P10-C16	266604.06	669190.56	5.14E+01	1.70E+01	2.29E+01	4.59E+01	1.58E+02	4.72E+03
P10-C17	266634.03	669189.00	3.80E+01	1.25E+01	1.75E+01	4.01E+01	1.24E+02	4.48E+03
P10-C18	266664.00	669187.44	2.87E+01	1.01E+01	1.43E+01	3.27E+01	7.91E+01	4.71E+03
P10-D18	266662.72	669163.44	5.14E+01	1.80E+01	3.61E+01	8.86E+01	1.97E+02	4.89E+03
P10-D17	266632.78	669165.00	2.75E+01	8.73E+00	2.46E+01	4.82E+01	1.28E+02	4.82E+03

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P10-D16	266602.81	669166.56	3.83E+01	8.05E+00	2.03E+01	5.65E+01	1.38E+02	4.89E+03
P10-D15	266572.84	669168.19	7.28E+01	2.64E+01	4.34E+01	8.74E+01	3.19E+02	4.95E+03
P10-D13	266512.94	669171.31	5.74E+01	2.04E+01	2.98E+01	1.83E+02	2.03E+02	4.91E+03
P10-D12	266482.97	669172.88	5.69E+01	1.61E+01	2.47E+01	8.03E+01	2.97E+02	5.25E+03
P10-D11	266453.03	669174.44	3.24E+01	9.57E+00	2.18E+01	5.00E+01	1.63E+02	4.99E+03
P10-D10	266423.06	669176.00	4.22E+01	1.03E+01	1.72E+01	4.55E+01	2.09E+02	5.74E+03
P10-D9	266393.09	669177.56	1.55E+01	4.12E+00	1.27E+01	2.46E+01	7.71E+01	5.33E+03
P10-D8	266363.13	669179.13	1.82E+01	3.07E+00	8.94E+00	3.71E+01	6.85E+01	5.25E+03
P10-E9	266391.84	669153.63	1.17E+01	8.16E+00	8.06E+00	1.49E+01	5.96E+01	5.42E+03
P10-E10	266421.81	669152.06	1.28E+01	4.83E+00	1.16E+01	1.92E+01	7.07E+01	5.77E+03
P10-E11	266451.75	669150.50	2.21E+01	1.05E+01	1.70E+01	3.28E+01	1.15E+02	5.42E+03
P10-E12	266481.72	669148.94	4.12E+01	3.37E+01	4.19E+01	8.83E+01	1.79E+02	5.32E+03
P10-E13	266511.69	669147.31	3.47E+01	1.90E+01	3.66E+01	7.41E+01	1.58E+02	5.81E+03
P10-E14	266541.63	669145.75	2.59E+01	9.90E+00	3.20E+01	5.36E+01	1.26E+02	5.66E+03
P10-E15	266571.59	669144.19	5.51E+01	1.30E+01	9.42E+01	1.13E+02	5.20E+02	5.47E+03
P10-E16	266601.56	669142.63	2.01E+01	4.89E+00	3.52E+01	4.14E+01	1.61E+02	6.88E+03
P10-E17	266631.50	669141.06	7.27E+01	2.96E+01	1.19E+02	1.98E+02	5.06E+02	6.09E+03
P10-E18	266661.47	669139.50	9.97E+01	4.10E+01	2.05E+02	3.99E+02	4.50E+02	4.56E+03
P4/6-A1	266823.72	669398.94	5.03E+00	1.33E+00	2.24E+00	3.60E+00	1.23E+01	1.17E+04
P4/6-A2	266853.72	669397.38	2.33E+01	5.74E+00	6.10E+00	1.23E+01	6.99E+01	7.59E+03
P4/6-A3	266883.69	669395.81	4.18E+01	8.85E+00	7.67E+00	1.21E+01	1.51E+02	8.30E+03
P4/6-A4	266913.59	669394.19	2.68E+01	2.35E+00	2.73E+00	1.04E+01	6.95E+01	7.42E+03
P4/6-A5	266943.59	669392.63	2.33E+01	2.38E+00	3.09E+00	1.66E+01	6.60E+01	7.23E+03
P4/6-A8	267033.47	669387.94	4.10E+01	4.48E+00	2.95E+00	8.02E+01	1.26E+02	7.28E+03
P4/6-A9	267063.44	669386.38	2.96E+01	3.26E+00	1.74E+00	6.27E+01	1.06E+02	1.11E+04
P4/6-A10	267093.34	669384.81	2.48E+01	2.71E+00	3.08E+00	2.02E+01	6.16E+01	6.96E+03
P4/6-A11	267123.34	669383.31	3.04E+00	5.75E-01	3.34E-01	1.88E+00	6.55E+00	6.94E+03
P4/6-A12	267153.31	669381.75	1.26E+01	1.18E+00	2.23E+00	1.69E+01	1.67E+01	1.15E+04
P4/6-A13	267183.22	669380.13	1.54E+01	1.51E+00	2.22E+00	2.92E+01	1.92E+01	1.47E+04
P4/6-A14	267213.22	669378.56	4.04E+01	6.65E+00	9.80E+00	4.18E+01	5.87E+01	1.51E+04
P4/6-A15	267243.19	669377.00	3.04E+01	4.75E+00	8.10E+00	4.29E+01	4.43E+01	1.26E+04
P4/6-B11	267122.16	669360.38	4.44E+01	2.27E+01	-9.55E-01	4.18E+01	6.60E+02	1.11E+04
P4/6-B10	267092.16	669361.88	7.22E+01	7.90E+00	1.07E+00	6.29E+01	3.79E+02	6.78E+03
P4/6-B9	267062.25	669363.44	4.04E+02	6.13E+01	1.86E+01	5.07E+02	2.57E+03	1.10E+04
P4/6-B8	267032.28	669365.00	1.04E+02	9.49E+00	4.28E+00	2.22E+02	3.41E+02	9.93E+03

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P4/6-B7	267002.28	669366.56	1.57E+02	2.20E+01	1.88E+00	1.25E+02	1.06E+03	1.15E+04
P4/6-B6	266972.38	669368.13	2.20E+02	2.42E+01	3.69E+00	5.68E+01	1.40E+03	1.09E+04
P4/6-B5	266942.41	669369.69	5.09E+02	3.24E+01	2.25E+01	4.70E+01	2.33E+03	7.13E+03
P4/6-B4	266912.41	669371.25	8.04E+01	6.82E+00	6.68E+00	4.78E+01	3.33E+02	1.60E+04
P4/6-B3	266882.50	669372.88	1.35E+02	1.43E+01	5.68E+00	6.30E+01	5.60E+02	8.50E+03
P4/6-B2	266852.53	669374.44	1.05E+02	2.13E+01	1.07E+00	8.02E+01	1.01E+03	1.05E+04
P4/6-B1	266822.56	669375.94	3.96E+01	7.69E+00	1.07E+01	2.99E+01	1.72E+02	8.44E+03
P4/6-C1	266821.34	669353.00	1.16E+02	1.73E+01	3.17E+00	1.06E+02	8.27E+02	6.82E+03
P4/6-C3	266881.28	669349.94	1.01E+02	2.09E+01	1.41E+01	5.06E+01	3.60E+02	6.95E+03
P4/6-C5	266941.19	669346.75	4.14E+02	4.65E+01	1.27E+01	2.38E+01	2.49E+03	6.82E+03
P4/6-C6	266971.16	669345.19	1.03E+03	1.22E+02	5.39E+01	-4.00E+01	6.33E+03	1.08E+04
P4/6-C7	267001.09	669343.63	1.46E+02	2.44E+01	1.02E+01	3.22E+02	7.56E+02	1.03E+04
P4/6-C8	267031.06	669342.06	1.02E+02	5.77E+00	3.01E+00	3.43E+02	1.51E+02	1.17E+04
P4/6-C9	267061.03	669340.50	5.59E+02	6.14E+01	1.32E+01	5.74E+02	2.39E+03	1.16E+04
P4/6-C10	267090.97	669338.94	1.37E+02	1.10E+01	6.99E-01	4.66E+01	3.12E+02	1.08E+04
P4/6-C11	267120.94	669337.44	2.35E+02	7.92E+01	5.28E+00	6.79E+01	1.88E+03	1.09E+04
P4/6-C12	267150.91	669335.88	9.79E+01	1.61E+01	2.77E+00	2.56E+01	2.49E+02	6.86E+03
P4/6-C17	267300.69	669328.00	1.93E+02	6.63E+01	1.01E+02	1.80E+02	5.15E+02	6.86E+03
P4/6-C18	267330.66	669326.44	4.76E+01	1.02E+01	3.23E+01	4.60E+01	1.35E+02	6.86E+03
P4/6-C19	267360.59	669324.88	1.35E+01	1.86E+00	9.63E+00	2.22E+01	3.34E+01	6.90E+03
P4/6-C20	267390.59	669323.31	9.72E+01	7.57E+00	1.77E+01	7.09E+01	2.34E+02	7.01E+03
P4/6-D22	267449.31	669297.19	3.42E+01	4.63E+00	2.46E+01	7.42E+01	9.19E+01	6.84E+03
P4/6-D21	267419.34	669298.75	4.72E+01	7.99E+00	1.70E+01	6.66E+01	1.95E+02	7.00E+03
P4/6-D20	267389.38	669300.31	4.53E+01	7.06E+00	1.14E+01	5.00E+01	2.22E+02	6.94E+03
P4/6-D19	267359.41	669301.88	2.61E+01	3.91E+00	6.40E+00	2.31E+01	7.53E+01	7.06E+03
P4/6-D18	267329.44	669303.44	2.15E+01	5.98E+00	5.17E+00	1.62E+01	1.05E+02	6.94E+03
P4/6-D17	267299.47	669305.06	3.51E+00	1.26E+00	2.09E+00	4.19E+00	1.58E+01	7.39E+03
P4/6-D14	267209.59	669309.75	5.33E+01	1.23E+01	9.62E+00	3.66E+01	1.73E+02	6.85E+03
P4/6-D13	267179.66	669311.31	4.47E+01	9.27E+00	3.39E+00	1.05E+01	7.39E+01	6.92E+03
P4/6-D11	267119.72	669314.44	5.14E+01	1.01E+01	1.50E+00	5.29E+01	2.31E+02	1.15E+04
P4/6-D10	267089.78	669315.94	2.14E+02	2.27E+01	1.51E+00	5.07E+01	7.58E+02	1.14E+04
P4/6-D9	267059.81	669317.50	4.77E+01	3.42E+00	1.65E+00	2.08E+01	1.15E+02	1.08E+04
P4/6-D8	267029.84	669319.13	3.45E+01	5.36E+00	1.69E+00	1.07E+02	1.74E+02	1.17E+04
P4/6-D7	266999.91	669320.69	1.91E+02	4.91E+01	8.85E+00	3.33E+02	9.16E+02	1.02E+04
P4/6-D6	266969.94	669322.25	2.94E+02	4.42E+01	8.65E+00	5.69E+01	1.93E+03	1.16E+04

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P4/6-D5	266939.97	669323.81	1.30E+02	1.33E+01	6.08E+00	1.94E+01	6.72E+02	6.77E+03
P4/6-D4	266910.03	669325.38	1.22E+02	2.47E+01	1.14E+01	1.97E+01	5.97E+02	6.58E+03
P4/6-D3	266880.06	669326.94	2.42E+01	4.58E+00	7.73E+00	9.48E+00	9.30E+01	6.61E+03
P4/6-D2	266850.09	669328.50	3.26E+01	1.22E+01	2.25E+01	2.17E+01	1.66E+02	7.88E+03
P4/6-D1	266820.13	669330.00	3.66E+00	8.50E-01	3.63E+00	5.87E+00	1.30E+01	6.49E+03
P4/6-E1	266818.94	669307.06	2.37E+01	6.28E+00	7.41E+00	3.09E+01	1.48E+02	6.92E+03
P4/6-E2	266848.91	669305.56	1.44E+01	1.20E+00	2.32E+00	2.34E+01	4.63E+01	8.30E+03
P4/6-E3	266878.88	669304.00	2.18E+01	3.47E+00	4.59E+00	2.23E+01	6.71E+01	7.59E+03
P4/6-E4	266908.81	669302.38	1.82E+01	1.70E+00	2.07E+00	2.34E+01	3.48E+01	9.11E+03
P4/6-E5	266938.78	669300.81	6.21E+01	8.04E+00	4.36E+00	2.65E+01	2.97E+02	8.32E+03
P4/6-E6	266968.75	669299.25	9.91E+01	1.54E+01	9.64E-01	3.63E+01	7.53E+02	1.14E+04
P4/6-E7	266998.69	669297.69	5.66E+01	1.85E+01	1.50E+00	6.17E+01	4.93E+02	1.12E+04
P4/6-E8	267028.66	669296.13	9.53E+01	1.66E+01	6.02E+00	1.10E+02	4.72E+02	1.06E+04
P4/6-E9	267058.63	669294.56	1.54E+01	1.81E+00	6.45E-01	1.74E+01	4.87E+01	1.07E+04
P4/6-E10	267088.56	669293.00	1.18E+01	1.57E+00	2.61E-01	1.60E+00	1.51E+01	1.20E+04
P4/6-E11	267118.53	669291.50	1.61E+01	1.87E+00	3.42E-01	6.38E+00	1.41E+01	1.06E+04
P4/6-E17	267298.28	669282.06	1.33E+01	3.89E+00	4.50E+00	1.46E+01	7.83E+01	7.21E+03
P4/6-E18	267328.25	669280.50	4.24E+00	1.12E+00	1.45E+00	3.23E+00	1.38E+01	7.19E+03
P4/6-E19	267358.19	669278.94	2.76E+01	3.01E+00	2.51E+00	3.08E+01	7.90E+01	6.97E+03
P4/6-E20	267388.19	669277.38	1.18E+01	1.77E+00	3.68E+00	1.41E+01	3.19E+01	7.17E+03
P4/6-E21	267418.16	669275.81	1.90E+01	2.54E+00	3.15E+00	1.21E+01	6.41E+01	7.32E+03
P4/6-E22	267448.09	669274.19	2.74E+01	2.69E+00	3.72E+00	1.61E+01	9.91E+01	7.03E+03
P4/6-F22	267446.91	669251.25	7.19E+01	1.04E+01	2.16E+00	2.12E+01	5.57E+02	7.35E+03
P4/6-F21	267416.94	669252.81	9.14E+00	1.84E+00	7.44E-01	6.61E+00	7.24E+01	7.37E+03
P4/6-F20	267386.97	669254.38	1.63E+01	3.59E+00	1.24E+00	5.91E+00	1.22E+02	7.05E+03
P4/6-F19	267357.00	669255.94	7.11E-01	2.07E-01	2.43E-01	4.61E-01	8.71E-01	7.59E+03
P4/6-F18	267327.03	669257.50	2.86E+01	4.62E+00	3.83E+00	7.58E+01	5.40E+01	7.06E+03
P4/6-F17	267297.06	669259.13	2.99E+01	9.79E+00	9.44E+00	6.37E+01	9.50E+01	7.37E+03
P4/6-F16	267267.13	669260.69	5.13E+00	1.16E+00	1.82E+00	8.31E+00	1.19E+01	6.89E+03
P4/6-F10	267087.38	669270.00	4.96E+01	1.19E+01	8.39E-01	2.92E+01	2.11E+02	1.14E+04
P4/6-F9	267057.41	669271.56	3.46E+01	5.86E+00	1.85E+00	4.52E+01	2.00E+02	6.91E+03
P4/6-F8	267027.44	669273.19	1.29E+02	4.04E+01	3.39E+00	7.20E+01	2.24E+03	1.14E+04
P4/6-F7	266997.50	669274.75	2.61E+01	6.10E+00	1.11E+00	2.44E+01	1.95E+02	1.15E+04
P4/6-F6	266967.53	669276.31	1.45E+01	3.34E+00	1.36E+00	8.76E+00	1.02E+02	1.06E+04
P4/6-F5	266937.56	669277.88	1.22E+01	2.74E+00	2.76E+00	4.94E+00	3.47E+01	7.84E+03

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P4/6-F4	266907.63	669279.44	6.45E+00	1.83E+00	2.24E+00	4.17E+00	1.68E+01	7.32E+03
P4/6-F3	266877.66	669281.00	7.39E+00	2.13E+00	3.26E+00	5.50E+00	1.72E+01	7.57E+03
P4/6-F2	266847.69	669282.56	5.01E+00	1.59E+00	2.71E+00	3.63E+00	1.44E+01	8.88E+03
P4/6-F1	266817.72	669284.06	1.25E+01	3.56E+00	6.01E+00	7.70E+00	4.94E+01	7.19E+03
P4/6-G1	266816.53	669261.13	1.64E+01	5.07E+00	6.23E+00	6.70E+00	2.71E+01	8.78E+03
P4/6-G2	266846.50	669259.63	1.29E+01	4.54E+00	5.22E+00	7.35E+00	1.97E+01	8.35E+03
P4/6-G3	266876.47	669258.06	7.28E+00	2.56E+00	3.17E+00	6.60E+00	1.26E+01	7.19E+03
P4/6-G4	266906.41	669256.50	2.87E+00	8.74E-01	1.28E+00	2.71E+00	6.04E+00	7.63E+03
P4/6-G6	266966.34	669253.31	6.23E+00	2.34E+00	5.17E-01	4.49E+00	4.25E+01	1.15E+04
P4/6-G7	266996.28	669251.75	1.01E+01	3.67E+00	4.28E-01	7.41E+00	9.53E+01	1.06E+04
P4/6-G8	267026.25	669250.19	2.53E+01	5.85E+00	1.12E+00	3.10E+01	2.43E+02	7.86E+03
P4/6-G9	267056.22	669248.63	4.14E+01	1.86E+01	-3.22E-01	5.07E+01	6.06E+02	1.12E+04
P4/6-G10	267086.16	669247.06	4.19E+01	1.64E+01	9.56E-01	1.37E+01	1.64E+02	1.12E+04
P4/6-G16	267265.91	669237.69	4.13E+01	8.54E+00	6.36E+00	3.91E+01	1.26E+02	7.14E+03
P4/6-G17	267295.88	669236.13	6.79E+01	2.21E+01	1.72E+01	7.29E+01	1.56E+02	7.26E+03
P4/6-G18	267325.84	669234.56	2.56E+01	7.40E+00	6.76E+00	2.95E+01	6.97E+01	7.11E+03
P4/6-G19	267355.78	669233.00	1.35E+01	2.15E+00	3.26E+00	1.98E+01	4.97E+01	7.18E+03
P4/6-G20	267385.78	669231.44	1.99E+01	3.01E+00	2.25E+00	2.03E+01	9.52E+01	7.22E+03
P4/6-G21	267415.75	669229.88	2.53E+01	4.45E+00	1.33E+00	1.83E+01	2.15E+02	7.32E+03
P4/6-G22	267445.69	669228.31	2.83E+01	4.30E+00	1.83E+00	1.93E+01	2.94E+02	7.28E+03
P4/6-G23	267475.66	669226.69	1.45E+01	1.85E+00	2.37E+00	2.47E+01	9.08E+01	7.07E+03
P5-A5	267376.78	669792.63	2.22E+00	8.30E-01	6.23E-01	7.38E-01	2.05E+00	1.11E+04
P5-A4	267326.78	669792.63	3.05E+00	2.10E+00	1.81E+00	2.18E+00	1.53E+01	1.08E+04
P5-A3	267276.78	669792.63	5.00E+00	2.92E+00	1.91E+00	4.81E+00	2.76E+01	1.07E+04
P5-A2	267226.78	669792.63	7.42E+00	1.56E+00	1.19E+00	3.07E+00	1.22E+01	1.10E+04
P5-B2	267226.78	669742.63	3.78E+00	1.27E+00	1.90E+00	1.82E+00	7.58E+00	1.07E+04
P5-B3	267276.78	669742.63	5.56E+00	4.96E+00	6.52E+00	2.53E+00	1.28E+01	1.07E+04
P5-B4	267326.78	669742.63	6.64E+00	1.66E+00	2.01E+00	2.38E+00	1.03E+01	1.09E+04
P5-B5	267376.78	669742.63	2.91E+00	7.75E-01	1.02E+00	9.24E-01	5.32E+00	1.11E+04
P5-C6	267426.78	669692.63	7.15E+00	1.61E+00	9.13E-01	2.79E+00	4.52E+00	1.12E+04
P5-C5	267376.78	669692.63	3.65E+00	1.11E+00	5.93E-01	9.81E-01	5.28E+00	1.11E+04
P5-C4	267326.78	669692.63	4.14E+00	2.25E+00	9.07E-01	1.20E+00	7.37E+00	1.11E+04
P5-C3	267276.78	669692.63	7.43E+00	3.65E+00	1.36E+00	1.05E+00	9.09E+00	1.10E+04
P5-C2	267226.78	669692.63	4.04E+00	1.02E+00	1.01E+00	5.03E-01	2.20E+00	1.09E+04
P5-D1	267176.78	669642.63	1.76E+01	2.46E+00	7.14E+00	2.00E+00	2.63E+01	1.08E+04

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P5-D2	267226.78	669642.63	1.32E+01	1.82E+00	1.06E+01	3.70E+00	8.02E+01	1.15E+04
P5-D3	267276.78	669642.63	7.97E+01	1.68E+01	4.29E+01	2.61E+01	5.54E+02	1.11E+04
P5-D4	267326.78	669642.63	2.71E+01	1.32E+01	4.97E+00	4.78E+00	8.00E+01	1.14E+04
P5-D5	267376.78	669642.63	3.81E+00	4.52E+00	1.34E+00	9.01E-01	2.00E+00	1.06E+04
P5-D6	267426.78	669642.63	1.16E+00	4.27E-01	7.47E-01	4.25E-01	1.31E+00	1.09E+04
P5-E7	267476.78	669592.63	1.39E+01	2.09E+01	4.85E+00	3.37E+00	9.30E+00	1.12E+04
P5-E6	267426.78	669592.63	1.18E+02	5.83E+01	3.14E+01	1.87E+01	3.77E+00	1.09E+04
P5-E5	267376.78	669592.63	7.39E+00	5.20E+00	3.16E+00	1.71E+00	2.46E+00	1.13E+04
P5-E4	267326.78	669592.63	4.84E+00	1.51E+00	2.24E+00	2.95E+00	1.04E+01	1.04E+04
P5-E2	267226.78	669592.63	3.71E+01	1.21E+01	1.87E+01	9.26E+00	1.29E+02	1.11E+04
P5-E1	267176.78	669592.63	1.04E+01	2.34E+00	3.24E+00	3.53E+00	2.84E+01	1.10E+04
P5-F1	267176.78	669542.63	5.56E+00	3.52E+00	1.86E+00	4.63E+00	2.45E+01	1.11E+04
P5-F2	267226.78	669542.63	9.82E+00	2.56E+01	4.03E+00	4.76E+00	3.94E+00	1.11E+04
P5-F3	267276.78	669542.63	9.00E+00	7.19E+00	2.36E+00	6.93E-01	2.05E+00	1.12E+04
P5-F4	267326.78	669542.63	1.03E+01	1.75E+01	4.02E+00	2.98E+00	2.14E+00	1.11E+04
P5-F5	267376.78	669542.63	1.40E+01	1.62E+01	1.31E+01	2.42E+00	5.29E-01	1.12E+04
P5-F6	267426.78	669542.63	5.57E+01	2.76E+01	2.75E+00	7.72E-01	-4.00E+00	1.14E+04
P5-F7	267476.78	669542.63	5.77E+00	2.90E+00	9.70E-01	9.99E-01	2.15E+00	1.10E+04
P5-G8	267526.78	669492.63	2.73E+00	1.07E+00	4.61E-01	4.97E-01	3.08E+00	1.11E+04
P5-G5	267376.78	669492.63	4.55E+00	1.57E+00	1.26E+00	3.27E-01	-2.13E-01	1.15E+04
P5-G4	267326.78	669492.63	4.25E+00	2.29E+00	1.73E+00	7.53E-01	1.36E+00	1.12E+04
P5-G3	267276.78	669492.63	6.04E+00	2.15E+00	5.25E+00	1.07E+00	7.32E+00	1.12E+04
P5-G2	267226.78	669492.63	6.02E+00	5.68E+00	4.87E+00	1.43E+00	6.82E+00	1.11E+04
P5-G1	267176.78	669492.63	2.28E+00	4.97E-01	4.25E-01	5.40E-01	6.17E-01	1.16E+04
P5-H5	267376.78	669442.63	6.14E+00	1.87E+00	1.25E+00	4.37E-01	1.02E-01	1.12E+04
P5-H6	267426.78	669442.63	6.45E+00	3.93E+00	2.48E+00	8.14E-01	2.12E+00	1.13E+04
P5-H7	267476.78	669442.63	3.61E+00	3.12E+00	1.89E+00	6.84E-01	1.06E+00	1.11E+04
P5-H8	267526.78	669442.63	4.77E+00	1.28E+00	1.02E+00	6.49E-01	5.58E-01	1.12E+04
T-A2	266949.41	669246.27	1.19E+00	4.97E-01	4.59E+00	4.79E+00	7.55E+00	6.81E+03
T-A3	266992.19	669401.94	1.07E+01	2.06E+00	2.12E+00	2.71E+01	3.70E+01	7.98E+03
T-A4	266964.68	669259.19	9.11E+00	1.74E+00	3.67E+00	5.16E+00	3.07E+01	6.57E+03
T-A5	266972.32	669265.65	9.12E+00	2.17E+00	3.34E+00	5.13E+00	5.27E+01	6.09E+03
T-A6	266979.95	669272.10	1.75E+01	2.87E+00	3.04E+00	6.08E+00	6.81E+01	6.04E+03
T-A7	266980.13	669394.63	2.25E+01	3.64E+00	2.38E+00	1.95E+01	1.13E+02	8.14E+03
T-A8	266977.75	669384.88	4.01E+01	5.66E+00	2.38E+00	4.61E+01	2.04E+02	1.02E+04

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
T-A9	267002.86	669291.47	2.61E+00	5.49E-01	1.24E+00	3.52E+00	1.53E+01	6.73E+03
T-A10	267010.50	669297.93	1.25E+02	2.10E+01	5.84E+00	3.92E+02	6.14E+02	6.64E+03
T-A11	267018.13	669304.39	2.09E+02	2.97E+01	1.69E+01	6.41E+02	6.08E+02	6.38E+03
T-A12	267025.77	669310.84	1.39E+02	1.89E+01	1.27E+01	4.60E+02	2.57E+02	6.59E+03
T-A13	267033.40	669317.30	3.86E+02	3.69E+01	2.64E+01	9.76E+02	4.63E+02	6.90E+03
T-A14	267041.04	669323.76	1.01E+03	7.41E+01	4.28E+01	1.78E+03	1.49E+03	7.12E+03
T-A15	267048.68	669330.21	1.29E+03	9.22E+01	4.91E+01	2.01E+03	2.31E+03	7.45E+03
T-A16	267056.31	669336.67	1.35E+03	1.08E+02	5.69E+01	2.27E+03	2.89E+03	7.20E+03
T-A17	267063.95	669343.13	9.44E+02	8.70E+01	1.84E+01	4.62E+02	3.72E+03	7.27E+03
T-A18	267071.58	669349.59	2.87E+02	2.89E+01	4.68E+00	4.75E+01	1.12E+03	4.81E+03
T-A19	267079.22	669356.04	3.64E+01	3.69E+00	3.15E-01	5.85E+01	1.75E+02	6.78E+03
T-A20	267086.86	669362.50	4.45E+02	4.97E+01	1.30E+01	3.75E+02	2.12E+03	6.90E+03
T-A21	267094.49	669368.96	7.58E+01	7.27E+00	1.59E+00	6.93E+01	3.20E+02	6.63E+03
T-B1	266948.23	669232.18	7.01E+00	1.27E+00	1.85E+00	4.84E+00	1.50E+01	6.27E+03
T-B2	266955.86	669238.64	8.49E+00	1.61E+00	5.96E+00	1.62E+01	2.47E+01	6.31E+03
T-B3	266963.50	669245.10	5.85E+00	1.30E+00	3.69E+00	9.33E+00	1.99E+01	6.21E+03
T-B4	266971.14	669251.55	1.02E+01	2.25E+00	6.41E+00	1.34E+01	4.54E+01	6.59E+03
T-B5	266978.77	669258.01	1.15E+01	2.66E+00	3.82E+00	1.03E+01	7.19E+01	6.27E+03
T-B6	266986.41	669264.47	1.97E+01	4.47E+00	3.67E+00	1.25E+01	1.45E+02	6.43E+03
T-B7	266994.04	669270.92	2.07E+00	1.30E+00	4.74E+00	2.63E+00	2.46E+00	5.97E+03
T-B8	267001.68	669277.38	5.03E+01	6.49E+00	3.34E+00	2.12E+01	2.42E+02	6.56E+03
T-B9	267009.32	669283.84	1.01E+02	2.10E+01	2.23E+00	7.29E+01	9.12E+02	6.73E+03
T-B10	267016.95	669290.29	1.41E+02	2.27E+01	8.17E+00	2.42E+02	1.02E+03	6.97E+03
T-B11	266958.75	669307.19	3.19E+02	4.17E+01	1.62E+01	7.47E+02	1.04E+03	7.86E+03
T-B12	266968.47	669304.81	5.30E+02	5.70E+01	2.30E+01	9.48E+02	1.21E+03	8.07E+03
T-B13	266978.19	669302.44	4.86E+02	3.78E+01	1.37E+01	7.47E+02	8.27E+02	8.03E+03
T-B20	267093.31	669354.86	1.00E+02	9.03E+00	-9.00E-03	4.13E+01	5.46E+02	6.77E+03
T-C1	266954.69	669224.55	5.29E+00	1.39E+00	1.59E+00	2.22E+00	6.38E+00	6.79E+03
T-C2	266962.32	669231.00	1.26E+01	1.85E+00	1.49E+00	4.84E+00	1.83E+01	6.77E+03
T-C3	266969.96	669237.46	1.39E+01	1.93E+00	1.32E+00	6.68E+00	3.65E+01	9.41E+03
T-C4	266977.59	669243.92	1.36E+01	2.06E+00	1.28E+00	6.41E+00	4.32E+01	1.02E+04
T-C5	266985.23	669250.37	1.39E+01	2.64E+00	1.31E+00	8.32E+00	8.47E+01	1.09E+04
T-C6	266992.87	669256.83	2.01E+01	4.55E+00	1.34E+00	1.12E+01	1.68E+02	1.00E+04
T-C7	267000.50	669263.29	3.02E+01	6.13E+00	1.29E+00	1.77E+01	2.82E+02	9.56E+03
T-C8	267008.14	669269.74	5.03E+01	7.80E+00	1.35E+00	2.66E+01	3.59E+02	9.05E+03

Table D-1. (continued).

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
T-C9	267015.77	669276.20	4.71E+00	5.26E-01	6.25E-01	4.03E+00	1.40E+01	7.33E+03
T-C11	267031.05	669289.12	2.14E+02	2.52E+01	1.04E+01	2.36E+02	8.63E+02	6.95E+03
T-C13	267046.32	669302.03	4.38E+02	5.45E+01	1.92E+01	3.98E+02	1.79E+03	7.37E+03
T-C14	267053.95	669308.49	3.39E+02	3.04E+01	1.74E+01	1.41E+02	1.06E+03	6.95E+03
T-C17	267076.86	669327.86	2.63E+02	2.62E+01	8.96E+00	7.61E+01	7.36E+02	7.05E+03
T-C19	267092.13	669340.77	7.72E+01	6.41E+00	-1.65E-01	2.38E+01	2.80E+02	6.59E+03
T-C20	267099.77	669347.23	7.77E+01	6.44E+00	-1.75E-01	2.38E+01	2.81E+02	6.56E+03
T-C21	267107.41	669353.68	9.75E+01	1.21E+01	-5.11E-01	4.58E+01	5.47E+02	6.73E+03

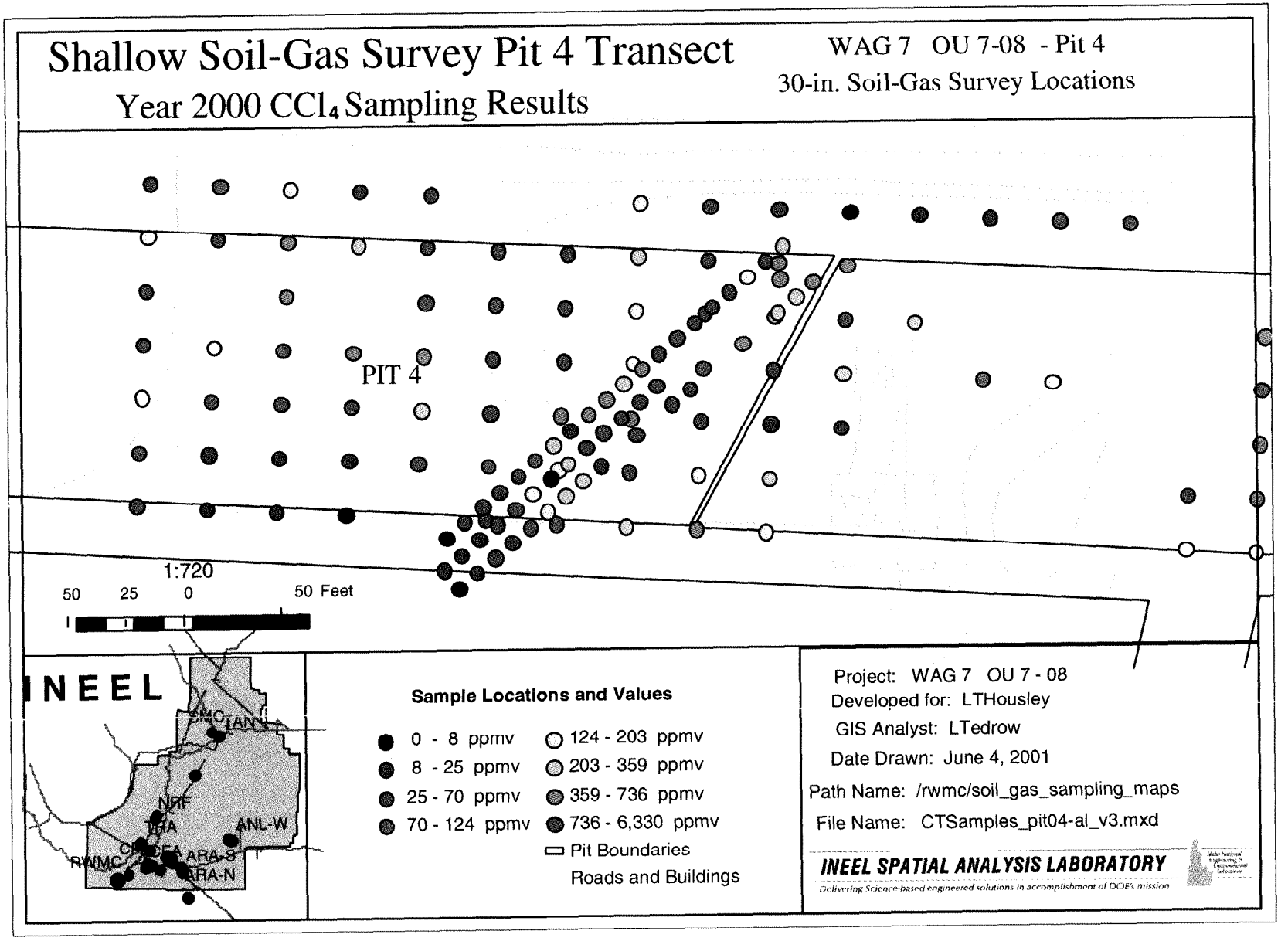

Figure D-1. Shallow soil-gas survey Pit 4 transect, Year 2000 CCl_4 sampling results.

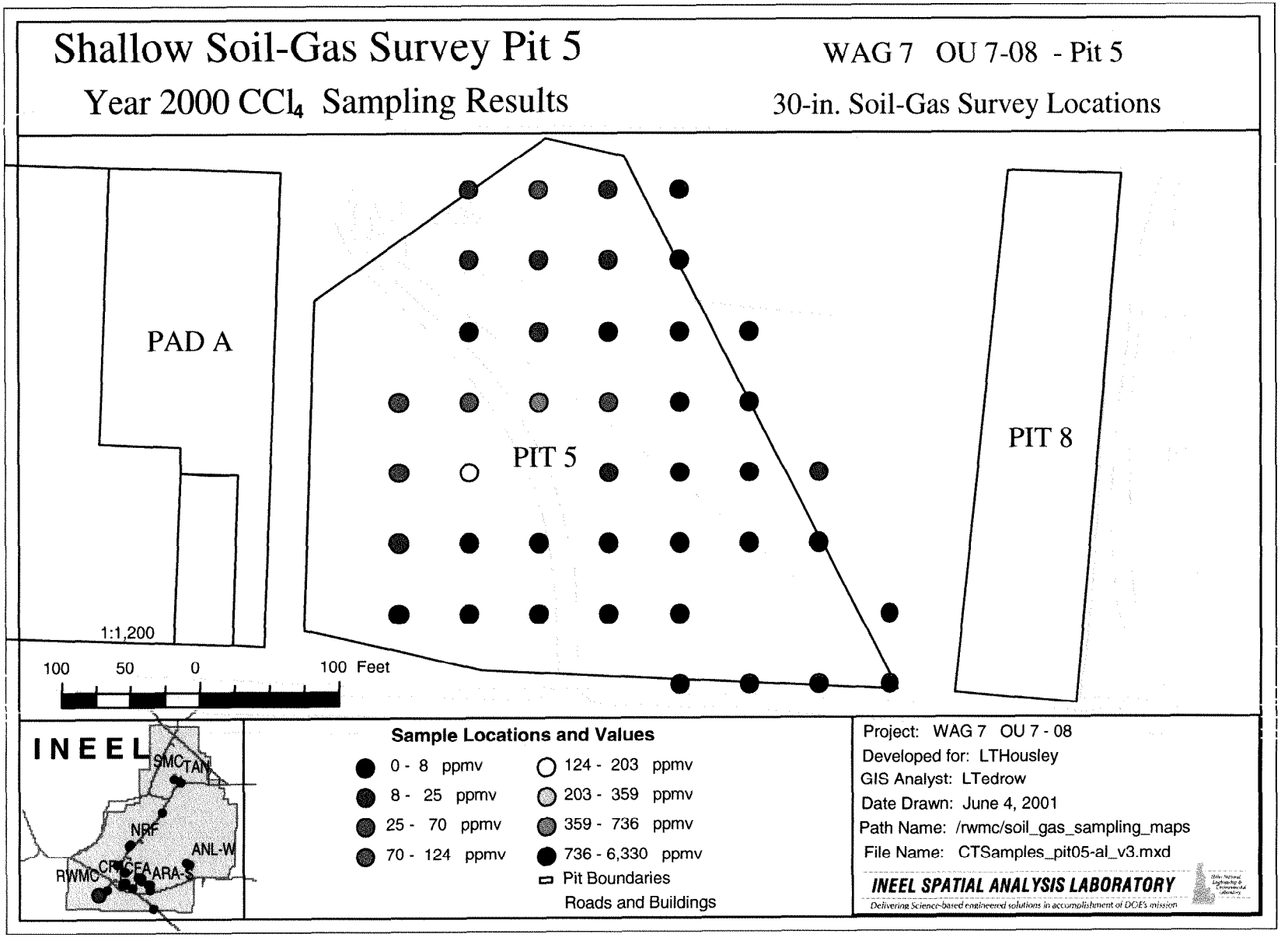

Figure D-2. Shallow soil-gas survey Pit 5, Year 2000 CCl_4 sampling results.

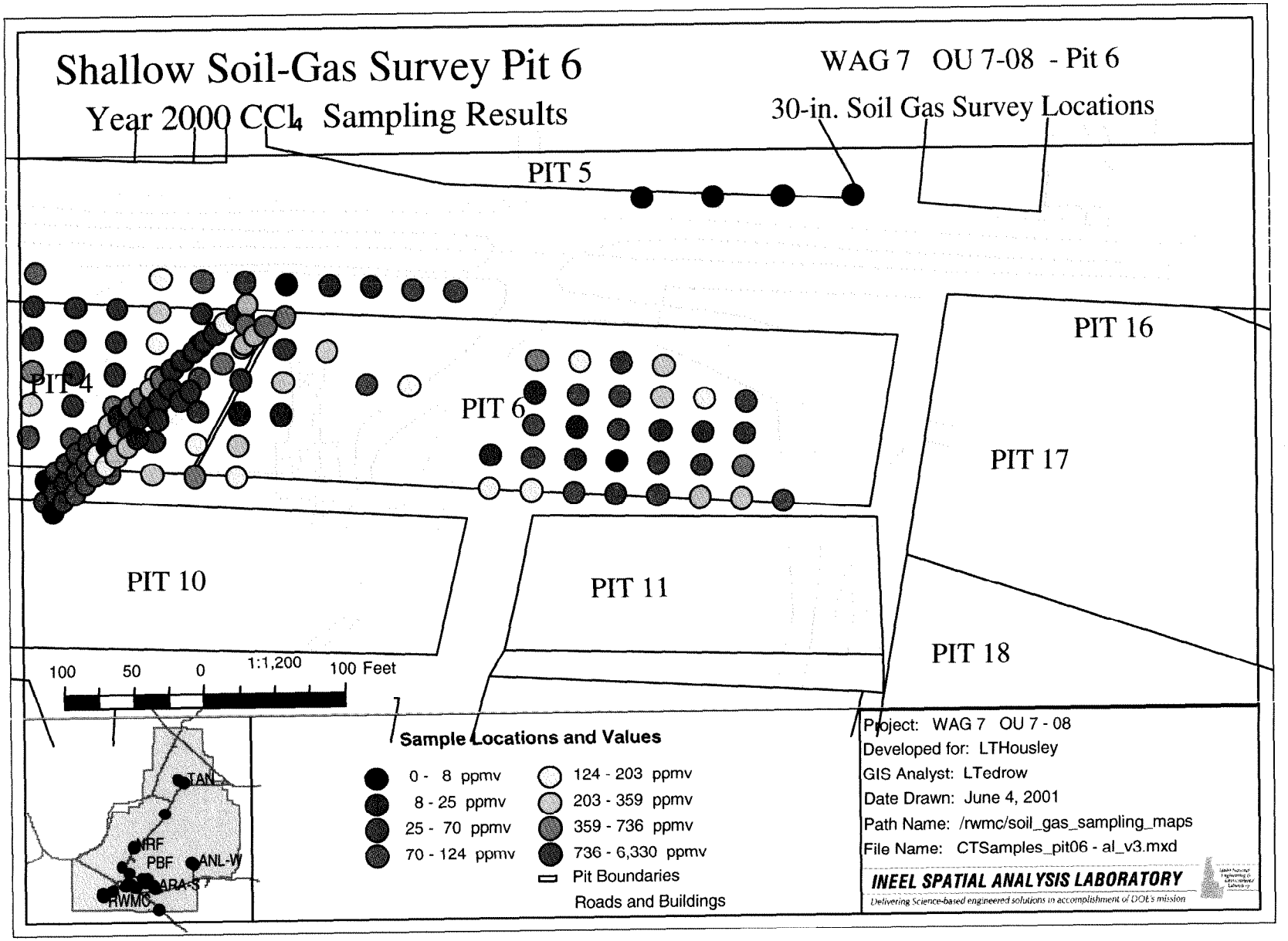

Figure D-3. Shallow soil-gas survey Pit 6, Year 2000 CCl_4 sampling results.

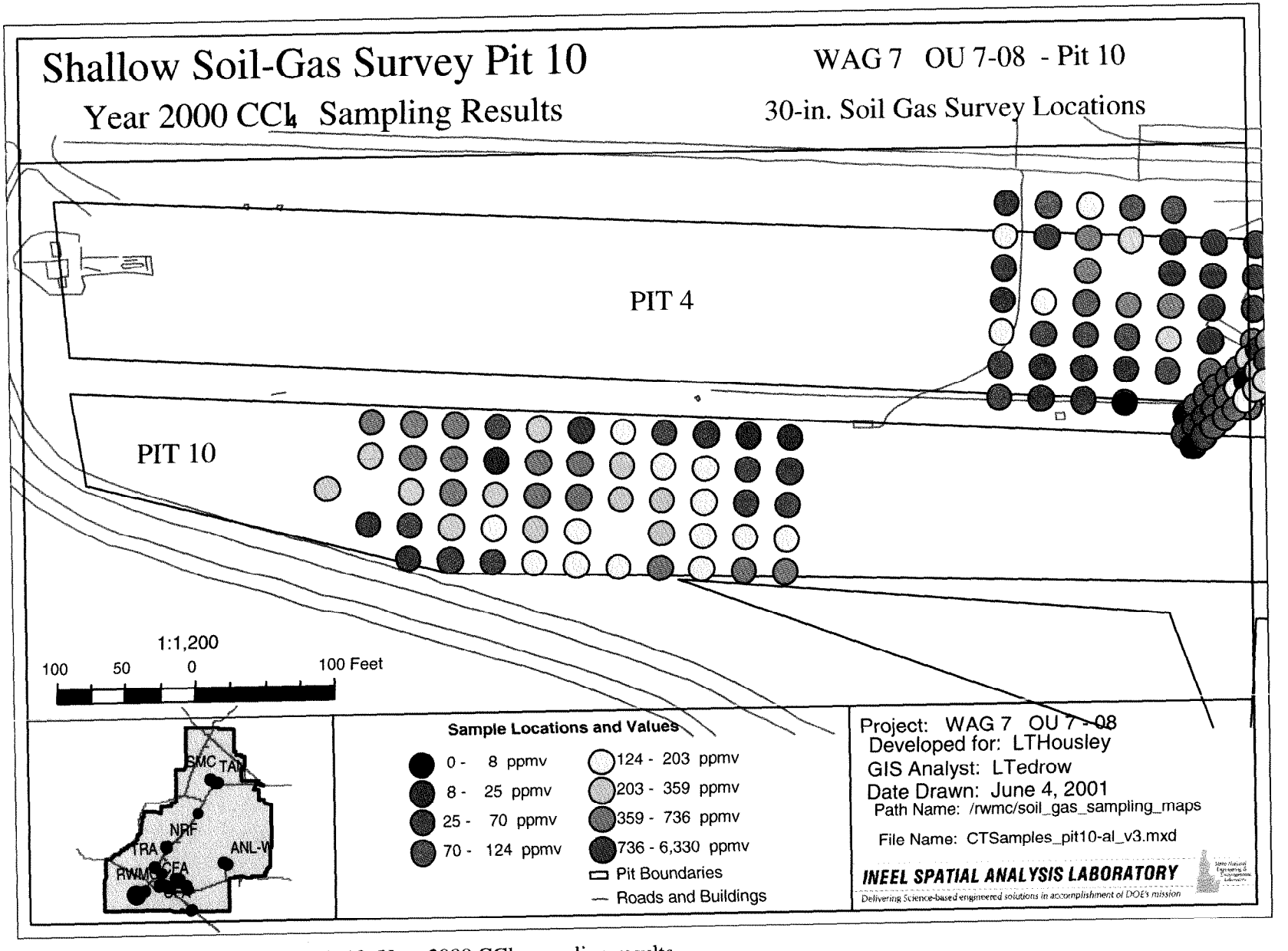

Figure D-4. Shallow soil-gas survey Pit 10, Year 2000 CCl_4 sampling results.

Appendix E

2001 Shallow Soil-Gas Survey

Appendix E

2001 Shallow Soil-Gas Survey

OVERVIEW

All procedures used in this survey are consistent with those used in the 2000 Shallow Soil-Gas Survey listed in Appendix D. The installation of ports for this survey occurred on October 31, 2001, and the subsequent sealing of the ports occurred on November 1, 2001. A map illustrating the port installation over Pit 2 is displayed in Figure E-1. Samples were collected on November 7 and 8, and were analyzed on the same dates using a Brüel and Kjær photoacoustic gas analyzer for CCl_4, TCE, PCE, 1,1,1-TCA, and $CHCl_3$. Because of some instrumental difficulties, some data points for analytes other than CCl_4 were unable to be obtained (recovered).

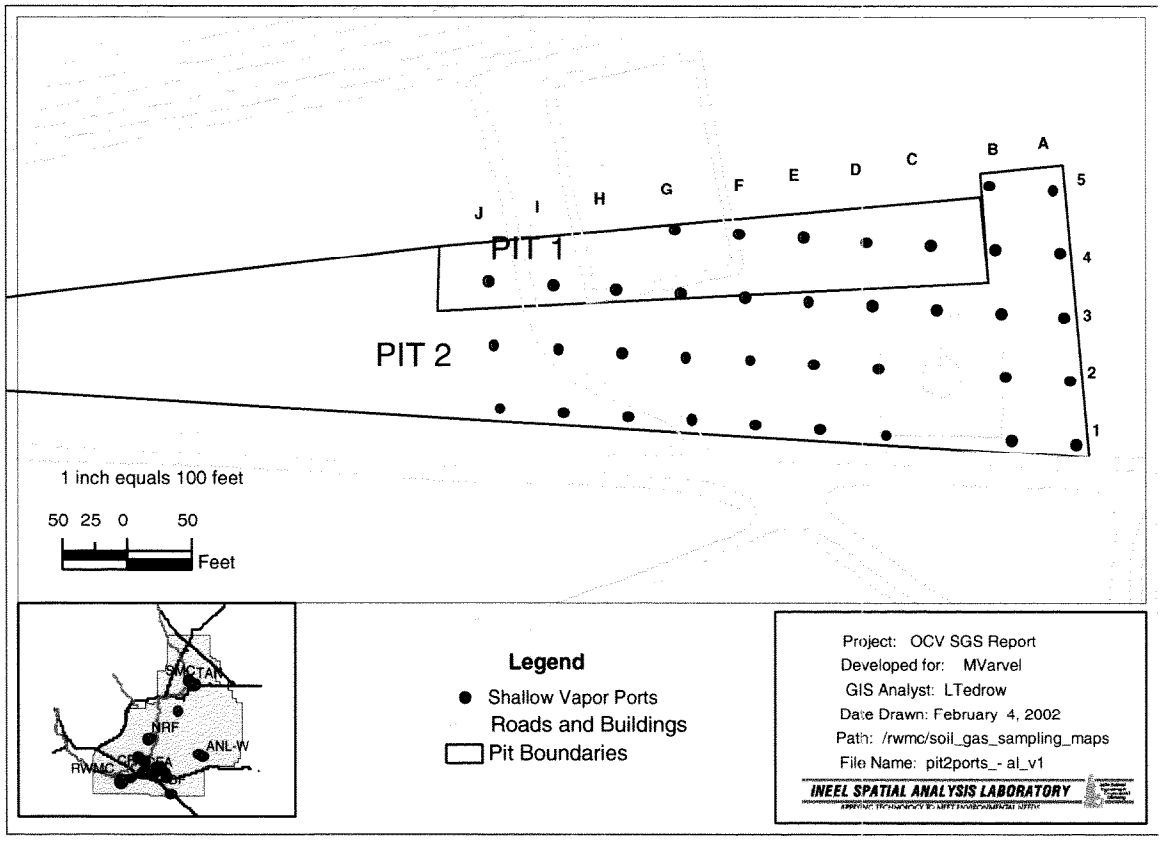

Figure E-1. Map showing port installation over Pit 2.

Table E-1. Sampling results of shallow gas survey (ppmv), Fall 2001.

Name	Easting	Northing	$CHCl_3$	1,1,1-TCA	PCE	TCE	CCl_4	Water Vapor
P2-A1	266035.34	669500.99	2.29E+00	3.25E+00	1.84E+00	2.49E+00	1.64E+00	8.37E+03
P2-A2	266030.93	669550.80	2.88E+00	7.04E+00	2.51E+00	4.05E+00	2.52E+00	8.50E+03
P2-A3	266026.52	669600.60	2.12E+00	3.71E+00	1.31E+00	2.38E+00	1.11E+00	8.42E+03
P2-A3	266026.52	669600.60	2.12E+00	3.69E+00	1.27E+00	2.32E+00	1.08E+00	8.44E+03
P2-A4	266022.11	669650.41	2.80E+00	5.14E+00	1.89E+00	1.89E+00	1.47E+00	8.61E+03
P2-A5	266017.70	669700.21	4.11E+00	6.95E+00	2.48E+00	2.21E+00	2.37E+00	8.51E+03
P2-B1	265985.43	669504.04	2.08E+00	2.69E+00	2.84E+00	1.92E+00	1.06E+00	8.65E+03
P2-B3	265976.61	669603.65	1.89E+00	2.10E+00	1.25E+00	2.73E+00	1.09E+00	8.60E+03
P2-B4	265972.20	669653.46	2.69E+00	4.84E+00	3.62E+00	1.92E+00	2.02E+00	8.54E+03
P2-B5	265967.79	669703.26	2.35E+00	3.08E+00	1.99E+00	1.85E+00	1.45E+00	8.37E+03
P2-C3	265926.70	669606.70	2.41E+00	4.16E+00	2.04E+00	5.44E+00	1.37E+00	8.63E+03
P2-C4	265922.30	669656.51	2.08E+00	2.25E+00	1.44E+00	4.34E+00	1.26E+00	8.48E+03
P2-C4	265922.30	669656.51	2.04E+00	2.23E+00	1.38E+00	4.05E+00	1.22E+00	8.61E+03
P2-D1	265885.62	669510.14	1.91E+00	3.51E+00	1.92E+00	3.52E+00	1.11E+00	8.47E+03
P2-D2	265881.21	669559.95	6.03E+00	2.12E+01	2.00E+01	3.29E+01	3.86E+00	8.80E+03
P2-D3	265876.80	669609.75	2.37E+00	4.86E+00	5.44E+00	1.09E+01	1.69E+00	8.54E+03
P2-D4	265872.39	669659.56	2.77E+00	2.43E+00	3.30E+00	2.54E+01	3.38E+00	8.50E+03
P2-E1	265835.71	669513.20	2.50E+00	3.89E+00	2.93E+00	3.15E+00	1.02E+00	8.51E+03
P2-E2	265831.30	669563.00	8.03E+00	1.34E+01	6.96E+00	1.05E+01	1.68E+00	8.41E+03
P2-E3	265826.89	669612.81	2.81E+00	3.97E+00	2.19E+00	4.82E+00	1.55E+00	8.56E+03
P2-E4	265822.48	669662.61	2.31E+00	1.88E+00	2.03E+00	3.90E+00	2.61E+00	8.40E+03
P2-F1	265785.80	669516.25	No Data	No Data	No Data	No Data	1.22E+01	No Data
P2-F2	265781.39	669566.05	No Data	No Data	No Data	No Data	1.36E+01	No Data
P2-F2	265781.39	669566.05	1.35E+01	3.16E+01	1.17E+01	2.84E+01	1.83E+01	9.74E+03
P2-F3	265776.98	669615.86	3.38E+00	3.22E+00	1.68E+00	5.29E+00	6.07E+00	9.68E+03
P2-F4	265772.58	669665.66	No Data	No Data	No Data	No Data	2.00E+01	No Data
P2-G1	265735.90	669519.30	4.41E+00	3.85E+00	1.61E+00	8.42E+00	4.54E+00	9.45E+03
P2-G2	265731.49	669569.10	1.29E+01	1.09E+01	4.72E+00	3.76E+01	5.05E+00	9.32E+03
P2-G3	265727.08	669618.91	5.97E+00	7.90E+00	3.88E+00	8.48E+00	7.49E+00	9.61E+03
P2-G4	265722.67	669668.71	4.46E+00	3.25E+00	2.90E+00	6.68E+00	9.63E+00	9.40E+03
P2-H1	265685.99	669522.35	3.19E+00	2.72E+00	1.17E+00	5.45E+00	3.12E+00	9.35E+03
P2-H2	265681.58	669572.15	3.00E+01	2.14E+01	1.01E+01	1.07E+02	4.89E+00	9.34E+03
P2-I1	265636.08	669525.40	4.31E+00	3.34E+00	2.00E+00	1.20E+01	3.62E+00	9.30E+03
P2-I3	265627.26	669625.01	7.85E+00	7.59E+00	3.41E+00	2.26E+01	1.29E+01	9.31E+03
P2-J1	265586.18	669528.45	5.21E+00	3.22E+00	1.47E+00	3.79E+00	5.64E+00	9.28E+03

Table E-1. (continued).

P2-J2	265581.77	669578.26	2.59E+01	1.57E+01	8.11E+00	9.20E+00	1.59E+00	9.65E+03
P2-J3	265577.36	669628.06	7.70E+00	6.67E+00	2.17E+00	9.40E+00	4.75E+00	9.47E+03
T-A3	266992.19	669401.94	9.19E+00	4.56E+00	1.98E+00	3.56E+00	5.00E+01	9.70E+03
T-A4	266964.68	669259.19	1.07E+01	4.57E+00	2.08E+00	4.62E+00	5.06E+01	9.81E+03
T-A5	266972.32	669265.65	1.22E+01	5.05E+00	1.94E+00	4.34E+00	6.36E+01	9.82E+03
T-A6	266979.95	669272.10	1.99E+01	6.55E+00	1.66E+00	1.91E+01	1.15E+02	9.66E+03
T-A7	266980.13	669394.63	1.77E+01	5.26E+00	1.30E+00	1.11E+01	8.50E+01	1.04E+04
T-A8	266977.75	669384.88	3.53E+01	1.46E+01	2.05E+00	5.73E+01	2.68E+02	1.04E+04
T-A9	267002.86	669291.47	9.20E+01	1.69E+01	9.77E+00	3.57E+02	2.31E+02	1.01E+04
T-A10	267010.50	669297.93	1.95E+02	3.92E+01	2.48E+01	6.69E+02	3.59E+02	1.03E+04
T-A11	267018.13	669304.39	1.55E+02	2.44E+01	1.63E+01	4.86E+02	2.03E+02	1.02E+04
T-A12	267025.77	669310.84	1.72E+02	2.29E+01	1.02E+01	4.04E+02	2.76E+02	1.03E+04
T-A13	267033.40	669317.30	4.85E+02	5.72E+01	2.51E+01	9.51E+02	1.35E+03	1.03E+04
T-A14	267041.04	669323.76	1.31E+02	1.41E+01	5.25E+00	3.18E+02	2.95E+02	1.03E+04
T-A15	267048.68	669330.21	1.61E+02	2.78E+01	4.45E+00	1.07E+02	8.74E+02	1.00E+04
T-A16	267056.31	669336.67	4.02E+01	8.61E+00	1.57E+00	1.15E+01	1.85E+02	9.69E+03
T-A17	267063.95	669343.13	1.69E+01	5.14E+00	5.37E-01	1.04E+01	7.33E+01	1.01E+04
T-A18	267071.58	669349.59	4.95E+01	1.83E+01	2.37E+00	9.55E+00	4.22E+02	9.93E+03
T-B4	266971.14	669251.55	1.22E+01	5.06E+00	2.01E+00	9.90E+00	7.04E+01	9.99E+03
T-B6	266986.41	669264.47	1.82E+01	6.71E+00	2.14E+00	1.11E+01	1.13E+02	9.85E+03
T-B7	266994.04	669270.92	No Data	No Data	No Data	No Data	2.15E+02	No Data
T-B8	267001.68	669277.38	4.11E+01	1.61E+01	2.32E+00	8.38E+01	2.97E+02	9.76E+03
T-B10	267016.95	669290.29	4.13E+01	1.62E+01	2.34E+00	8.24E+01	2.97E+02	1.00E+04
T-B11	266958.75	669307.19	3.06E+02	6.32E+01	2.14E+01	5.09E+02	9.45E+02	1.00E+04
T-B14	267041.04	669323.76	1.07E+02	1.22E+01	4.89E+00	2.67E+02	2.31E+02	1.00E+04
T-B15	266989.31	669333.02	4.62E+01	1.22E+01	1.96E+00	4.51E+01	1.99E+02	9.71E+03
T-B16	266996.95	669339.47	2.53E+02	3.24E+01	8.07E+00	8.94E+01	6.61E+02	9.94E+03
T-B17	267004.58	669345.93	5.01E+02	1.09E+02	1.09E+01	-4.20E+01	2.62E+03	1.01E+04
T-B18	267012.22	669352.39	7.42E+01	9.49E+00	5.81E-01	9.77E+00	2.30E+02	9.78E+03
T-B19	267019.85	669358.84	2.77E+01	5.14E+00	3.87E-01	1.01E+01	1.57E+02	9.78E+03
T-B20	267093.31	669354.86	8.27E+00	2.50E+00	4.01E-01	6.40E+00	3.34E+01	9.43E+03
T-C5	266985.23	669250.37	1.88E+01	7.61E+00	1.92E+00	8.21E+00	1.50E+02	9.56E+03
T-C6	266992.87	669256.83	7.03E+00	2.63E+00	1.09E+00	5.03E+00	2.94E+01	9.56E+03
T-C7	267000.50	669263.29	No Data	No Data	No Data	No Data	2.33E+02	No Data
T-C8	267008.14	669269.74	7.73E+01	2.74E+01	5.82E+00	3.31E+01	9.05E+02	9.63E+03
T-C9	267015.77	669276.20	8.10E+01	2.47E+01	4.92E+00	6.27E+01	7.86E+02	9.71E+03
T-C10	267023.41	669282.66	8.00E+01	2.42E+01	4.72E+00	6.08E+01	7.64E+02	9.84E+03

Table E-1. (continued).

T-C11	267031.05	669289.12	2.83E+02	5.56E+01	1.72E+01	2.23E+02	1.51E+03	9.89E+03
T-C12	267038.69	669295.57	1.75E+02	3.57E+01	1.29E+01	9.24E+01	9.67E+02	9.65E+03
T-C13	267046.32	669302.03	No Data	No Data	No Data	No Data	5.42E+02	No Data
T-C14	267053.95	669308.49	5.75E+02	9.78E+01	4.06E+01	1.11E+02	3.38E+03	9.86E+03
T-C15	267061.58	669314.94	1.00E+03	1.96E+02	7.79E+01	4.64E+01	6.76E+03	1.00E+04
T-C16	267069.22	669321.40	9.31E+01	1.93E+01	2.05E+00	1.55E+01	3.10E+02	9.45E+03
T-C17	267076.86	669327.86	3.12E+02	3.05E+01	2.28E-01	8.60E+00	5.55E+02	9.57E+03
T-C18	267084.50	669334.31	2.22E+02	3.34E+01	2.01E+00	1.21E+01	7.09E+02	9.61E+03
T-C19	267092.13	669340.77	1.42E+02	1.51E+01	1.35E-01	3.25E+01	4.00E+02	9.35E+03
T-C20	267099.77	669347.23	4.95E+01	1.11E+01	5.07E-01	1.65E+01	2.57E+02	9.52E+03